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EXPERIMENT STATION RECORD.

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One of the notable signs of progress in our agricultural institutions is found in the agricultural library. Those who have not seen the chaotic condition, the lack of attention, and the prodigal waste which characterized many of the libraries a few short years ago can hardly realize what a change has taken place. It marks a very important transition for the student, the teacher, and the investigator; and it has made the college a center of knowledge in a new and larger sense.

Not only is the vast amount of material that can be had for the asking now being collected and bound and cared for very generally, but new treatises are selected with greater discretion, the sources of information are being catalogued, and the attempt made to make the most of the facilities at hand or near by. The library has taken on new life and interest as an essential part of the working equipment. The attitude toward it has changed. Instead of being a collection of books which are shelved and unknown except to the few, it is being vitalized by modern methods of management and brought into larger usefulness by making its store of knowledge readily accessible. Students are taught to use books, and investigators and teachers are provided to some degree with bibliographic help.

The importance of the proper organization and management of the libraries of our agricultural colleges and experiment stations led to the consideration of this matter at the last convention of the Association of American Agricultural Colleges and Experiment Stations, in two separate reports. These were presented by the bibliographer, Dr. A. C. True, and by the committee on station organization and policy. The former dealt with the opportunities for cooperation among institutions to render their libraries more efficient in meeting the needs of their constituents, and the latter treated more specifically of the organization and function of the experiment station library.

In very many instances the experiment station has been the inciting cause which has led to more adequate attention to the library. The need was especially emphasized there. It was early apparent that the library lies at the very heart of the experiment station work in so far as that work develops into original lines and embraces real

research features. Books and periodicals become quite as essential as apparatus and other facilities, and the need for these develops with every new line of investigation.

Hence many of the stations, finding only meager collections in the college and little care given to them, early began building up libraries of their own, later making provision for their care and for some bibliographic assistance. This example and the growing needs of the college quickened interest in the college library, and has led to special provision for it. At nearly every agricultural college, whether separate or associated with a university, the library is now receiving considerable attention in the way of funds and of intelligent treatment, and becoming a strong and efficient department of the institution. Hence the college library is in far better position to aid the experiment station than it was formerly, and the argument for a separate station library has lost much of its force. A union of the two will usually serve to supplement the resources without undue duplication, and better meet the requirements of both the station and the college men.

The station workers are now rarely housed in a single building, but are often scattered as widely as the college departments. A scattering of the library through various offices in remotely located buildings, as is often the case, adds to the inconvenience and annoyance of the workers as a whole and defeats the central idea of a library.

It should, of course, be recognized in any efficient library management that certain handbooks and treatises are used almost constantly for reference, and should be deposited in the departments where most needed, even to the extent of duplicating copies in the library if necessary. But the natural tendency of most men is to accumulate larger and larger numbers of books in their departments, and this tendency often needs to be checked to maintain the department libraries within bounds. The largest convenience of all the staff must be the object aimed at; and because books are near at hand it does not necessarily follow that they are more accessible. The important matter to the investigator is to be able to get the material he wants when he wants it; and the place where the books are shelved is of less importance, provided it is readily accessible, than that there should be a competent person to look after them and render bibliographic assistance.

As the mission of the station library is to serve its investigators and scientific workers, it is from its nature mainly a reference collection of technical books and pamphlets. It should therefore be selected with discretion, and not with a view to building up a general agricultural library. The responsibility of providing such a general agricultural library may properly be left to the college or uni-

versity with which the station is connected. The station has neither means nor facilities for providing and caring for such a general collection, which it needs only occasionally.

But even in this restricted field it is not reasonable to expect that the stations, with the increasing amount and diversity of their investigations, can develop library facilities adequate to their needs. Their workers will employ all the facilities on the grounds, and will then need help in procuring loans from other institutions. The station's contribution to the library resources of an institution will at best be relatively small.

These considerations led the committee on station organization and policy to the conclusion that in an institution of limited funds the interests of the station and the college can best be served by combining forces and resources in one strong library. Such a combination husband's the resources and insures better management and library assistance. The committee recommended therefore that "as a general proposition the station library should be organized as a part of the main library of the college or university, in the sense of being subject to the same general management, and being catalogued with the main library in order to show fully the resources of that library. . . .

"Where the college or university library is conveniently accessible to the station workers there is much to be said in favor of having the station's collections deposited in the college library, in a separate reference and reading room for the station staff, with an assistant in charge. On the other hand, where the college of agriculture and the experiment station are located at an inconvenient distance from the university library, a separation of the agricultural library seems desirable. In such case the station collections should be maintained strictly for reference purposes and the college collection used for circulation."

Both of these plans would preserve the station's collections intact and available to its men for consultation or loan. They would likewise provide trained assistance in looking up references and securing books from the outside, as well as for the general upkeep of the collection.

The report of the bibliographer of the association pointed out the almost utter lack of cooperation and coordination among the libraries of the agricultural colleges and experiment stations. As a result we have a group of more than fifty libraries interested in identical lines of literature, striving independently with more or less zeal to collect and file publications of similar character, each ignorant of the resources of the others and too frequently ignorant of all resources apart from its own meager collection of books, periodicals, and official documents.

The final purpose of the librarian has been described to be "to bring a book to a reader and to bring a reader to a book." But among the libraries of the state agricultural colleges and experiment stations few can hope to have a collection adequate to the needs of both the student and the investigator. The merest essentials in the way of scientific periodicals and books of reference tax the resources of most of them, and for the highly specialized literature they must draw upon other collections as needed. At present this is done chiefly by appeal to the government libraries at Washington, all of which respond liberally to requests for interlibrary loans. In this respect the Library of the Department of Agriculture is the chief source of aid to the smaller institutions. As a national agricultural library, it has aimed to extend its services as far as possible to the investigators in agricultural science throughout the country. The relations of the Department with the land-grant colleges and experiment stations are such as to especially commend this course.

The Department Library at the present time probably contains the largest collection of literature on agriculture and related sciences in this or any other country. But it is doubtful whether its facilities are fully known to the librarians of the land-grant institutions. At present its collections number one hundred and twenty-two thousand books and pamphlets. Its accessions numbered over nine thousand last year. It is especially strong in scientific and technical periodicals and society publications. Nearly two thousand periodicals are received currently. Its dictionary card catalogue contains approximately two hundred and eighty-six thousand cards, and is an invaluable key to the literature of agriculture and the related sciences.

The extent of its loans to the agricultural college and experiment station workers has steadily increased from an occasional book a few years ago to six hundred and twenty books the past year. These went to persons in thirty-nine different States and Territories, ranging from Maine to Hawaii and from Oregon to Florida and Porto Rico. With a wider knowledge of the Department Library's facilities and practice of loans it is believed that it might perform to an even larger extent the duties of a national library of agriculture, to the material advantage of experiment station investigators.

To borrow from a library at a distance is a comparatively simple matter when accurate information is at hand concerning the book desired. In case of an obscure, insufficient, or inaccurate reference, however, it is often difficult in the absence of extensive bibliographic aids to identify the publication definitely enough to warrant a formal request. Frequently the verification of a reference is desired, or other information for which the transportation of a volume would not be necessary except for the fact that the lending library can not reasonably be asked to work upon meager data, or to take the time to trace a statement to its source.

Furthermore, the librarian who deals to any extent with official literature oftentimes finds himself lacking, on the one hand, some necessary volume and on the other possessed of a number of duplicates which he lacks space to file and time to arrange, but which are too valuable to be thrown away. Documents from the Federal Government can be sent back to Washington under frank, but state documents, reports of institutions, foreign and domestic, odd numbers of periodicals, reprints, and the like, are a veritable burden and their disposition an unsolved problem.

No small library can hope by its unaided efforts to establish a system of exchange by which its duplicate material may be made to contribute to its resources, inasmuch as the labor of operating such a system and the cost of transportation would exceed the value of the publications acquired. The task would seem one that could best be performed through the cooperation of a group of closely related libraries whose scope and purpose are similar.

The Library of this Department has from time to time distributed lists of its duplicates to the libraries of the state colleges and experiment stations, and has furnished these duplicates where desired without demanding an equivalent. The extent to which this duplicate exchange service and the lending of books are utilized leads to the belief "that this work might be organized advantageously on a wider basis and operated on a larger scale under more extensive cooperation on the part of the agricultural colleges and experiment stations."

The bibliographer's report suggested that the functions of the Department Library might be extended so that it could act as a central agency for the receipt and distribution of duplicates among the libraries of the agricultural colleges and experiment stations, and supplement their work by acting as a bureau of bibliographic information. "Such an agency would have access to all libraries in Washington for securing desired information and for the arranging of loans. For locating publications not available in Washington, the union catalogue of the Library of Congress would be of great assistance, since it represents a number of large libraries in different sections of the country. Selected reprints more convenient for transportation than large volumes would gradually accumulate and serve as the basis of a lending collection which would be supplemented by other collections in Washington and elsewhere. In case of bulky, rare, or much used publications, for which a loan could not be arranged, photographic reproductions of specified portions might be furnished."

The possibilities in this direction are large. Many of our station investigators are removed from large centers, and feel the isolation with special force in respect to the library facilities at

their command. Nearly every worker is conscious sooner or later of the inadequacy of the local collections, especially when the literature of a special subject is being looked up. Every investigator will realize how great a service might be rendered to his work by extending the necessarily limited facilities of the local libraries, and bringing to their disposal the most complete collections and catalogues in the country.

A highly important step has been taken in definitely recognizing the needs of the college libraries and placing them on a greatly improved basis. The next logical step is to extend their individual facilities through cooperation. This implies, for one thing, a more intimate relationship, the way for which has been opened by the formation of an agricultural section in the American Library Association. The Department Library is in position to extend its services in the direction of loaning books and furnishing a limited amount of bibliographic assistance. For it to provide the larger service and manage the various lines of cooperation suggested between libraries would require not only additional funds but larger quarters. It would, however, be a measure of economy, and would contribute in many ways to the larger efficiency of the comprehensive system of American agricultural institutions.

CONVENTION OF ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS, 1912.

The year 1912 marked the fiftieth anniversary of the birth of the agricultural college in this country under the Morrill Act, and of the National Department of Agriculture at Washington. It was also the twenty-fifth anniversary of the experiment station as a national institution. These facts very naturally made the 1912 meeting an anniversary convention, with special addresses commemorative of these important measures and of the institutions which have grown out of them.

These addresses were by Dr. A. C. True, of this Office, on The United States Department of Agriculture, 1862-1912; Dr. W. O. Thompson, of Ohio, on The Influence of the Morrill Act Upon American Higher Education; Dean Eugene Davenport, of Illinois, on The American Agricultural College; and Dr. H. C. White of Georgia, on The Experiment Stations.

The president's address, by Dr. W. E. Stone, of Indiana, was also largely historical, viewing the development of the land-grant institutions in relation to the theory and practice of education, and to other educational institutions, and dealing with some of the special problems and dangers which still confront these colleges. Dr. Stone appealed to the common interest of all the land-grant colleges in upholding the position of agricultural education and maintaining the integrity of their field, having due regard to the highest interests of the state.

These anniversary papers have been noted editorially in preceding issues. The association will have them published in advance of the proceedings for wider and more prompt circulation.

The report of the executive committee detailed its efforts in behalf of the Lever bill for agricultural extension, and the status of this bill at the close of the last session of Congress, and it emphasized the great importance to the colleges and stations at this juncture of securing the passage of the measure. Senator Hoke Smith of Georgia, who is sponsor for the measure in the Senate, addressed the convention and explained his plans and hopes for its passage. The association voted to memorialize Congress in behalf of this measure, and expressed its approval of a draft of such a memorial presented by the executive committee. Mr. H. H. Gross, of the National Soil Fertility League, addressed the convention by invitation, expressing the deep and active interest of the league in the passage of the extension bill.

The treasurer's report showed a balance of \$3,414 on hand, in view of which the executive committee recommended that the annual dues be reduced to \$35 for each college and \$20 for each station, which was approved. The committee also called attention to the agricultural conferences arranged for by the International Committee on Agriculture at Ghent, Belgium, during the summer of 1913, and asked authority to designate a representative.

The report of the bibliographer, Dr. A. C. True, dealt with the lack of cooperation between librarians of the various colleges and experiment stations, and suggested some lines of cooperation which might be profitable. Among these

were the maintenance of an exchange for the disposal of duplicate state documents, reports of institutions, odd numbers of periodicals, etc.; a loan exchange; the verification of references, or supplying of information not requiring the loan of the book. (See also p. 3.)

The committee on instruction in agriculture reported, through Dr. A. C. True, on the work of the agricultural colleges in training teachers of agriculture for secondary schools, based on a study of catalogues and opinions collected through a circular letter. Among the committee's recommendations were that "teachers of agriculture in secondary schools should have not less than twenty semester hours of professional training, including instruction in educational psychology, history of education, pedagogy, and special methods applicable to agriculture in the secondary schools, supplemented by practice in teaching. . . . Definite provision should be made for practice teaching on the part of those preparing to teach agriculture. . . .

"Inasmuch as the supply of properly trained teachers of agriculture will continue below the demand for some time, the agricultural college should make special provision for training teachers already in high-school service who desire to fit themselves to become teachers of agriculture in secondary schools. In this work special emphasis should be laid on the acquirement of the subject matter of agriculture, including both the science and practice. Agricultural instruction of collegiate grade should be offered in summer sessions or through correspondence courses, and provision should be made for credit for this work on passing suitable examination."

The committee on graduate study gave an account of the fifth session of the Graduate School of Agriculture, held at Michigan Agricultural College, during July, 1912. The session of this school has been previously described in these pages (E. S. R., 27, p. 101).

The committee on experiment station organization and policy reported through Dean E. Davenport, advising against the association taking any action in regard to publishing the lists of projects conducted by the stations under the Adams fund, as the suggestion of the station section last year was found to have little approval and to meet considerable strong objection.

In regard to the organization of the station library, the committee recommended that while local conditions must necessarily be considered, as a general proposition the station library should be organized as a part of the main library of the college or university in the sense of being subject to the same general management and being catalogued with the main library in order to show fully the resources of that library. (See also p. 1.)

In regard to the distribution of station publications, the committee recommended (1) that station publications be sent free so far as facilities permit, giving preference to local applicants; (2) as an alternate that applicants be advised to have their names listed for the Monthly List of Station Publications issued by the Office of Experiment Stations; (3) that bulletins be classified by subjects, in the interest of their economy. The suggestion was made that foreign exchanges may be made through the Smithsonian Institution at a considerable saving.

A paper on Courses of Study in Agricultural Colleges, by Prof. F. S. Jenks of the U. S. Bureau of Education, gave an analysis of the courses of study at a considerable number of agricultural colleges as shown by their catalogues. This analysis brought out the great disparity in the amount of time spent on various subjects and the requirements for graduation. The paper precipitated discussion on the differentiation in instruction between men who are to be practitioners and those who are to become investigators, teachers, etc., and the requirements in preparing men for the latter line of activity.

Bearing directly on this subject was Prof. M. F. Miller's paper on The Proper Correlation of Practice Work and Scientific Work. Professor Miller thought there should be more differentiation between courses of study for practical and for technical men. The demand for practical men in the middle west has strongly affected the courses of study. In the collegiate courses the study should be scientific and technical, and graduate work was held to be the most feasible method for providing the practical features.

The great demand for men for investigation, teaching, and extension work was pointed out, and it was noted that as the colleges are not able to supply the demand for leaders many ill-fitted men are put into such positions. Training for extension work and also for teaching, calls for intimate practical knowledge of farm affairs. This practical training can be secured outside the college. The practical work of the college should be restricted to such as can not be had elsewhere. When the time is restricted preference should be given to the technical and fundamental studies.

It was held that our courses should do ample justice to men preparing for both technical and practical careers, but it was pointed out that the schools of agriculture offer an opportunity to some extent as a training school for practical men. The difference in requirements for men of different training and ability should lead to differentiation in the college course.

Dean C. F. Curtiss suggested that the end in view might be reached by allowing for electives in the last two years to meet the special needs of the student. There is demand for graduate work for men who are preparing for technical lines of service. Good graduate work should, therefore, be offered by the colleges.

President E. A. Bryan emphasized the necessity of thorough training in the fundamental sciences regardless of whether the student is to be a technical or a practical man, to aid him in obtaining the scientific method of thought.

Dean H. C. Price described a combination which is being worked out at Ohio State University in a five-year course, taken in part in the college of arts and a part in the college of agriculture. This gives a better preparation. At the end of four years a degree can be taken from the arts course and in one year more the degree from the agricultural course.

Dr. W. H. Jordan urged the value of the fundamental sciences as the best training to teach men to think. He declared that "what a man needs on the farm is understanding," and that "it is the trend of mind that succeeds and not the man who is in possession of facts."

President K. L. Butterfield presented a report on the proposed American committee to study European credit systems in 1913. This movement started with the Southern Commercial Congress, the plan being to send two men from each State. The question was raised as to the part which the agricultural colleges might take in this inquiry. Correspondence showed that only about one-third of the college presidents favored an attempt to get state appropriations to defray the expense of two state delegates, one to be chosen from the agricultural college.

President Butterfield presented an argument for a thorough study of European methods, conducted by competent men, but questioned the desirability of so large a commission as was planned, and the convention declined to seek representation upon it. It, however, expressed its belief in the great importance of securing more liberal credit conditions for American farmers, and favored a thorough study by experts of rural credit systems of Europe and their adaptation to American conditions.

President R. A. Pearson submitted a plan for the selection of agricultural experts from this Department and the agricultural colleges and experiment

stations to be sent abroad to conduct studies of special problems or practices in the field of agriculture, such persons to be designated or approved by the association through its executive committee and commissioned by the Department. Reference was made to the large number of experts sent to this country by European governments to secure first-hand knowledge. The trips made abroad by our agricultural experts are largely of private character and are usually too hurried for anything like thorough study. This matter aroused considerable interest, and the plan received the approval of the convention.

On motion of President Butterfield the executive committee was instructed to elaborate a declaration of principles relating to the field and function of the colleges and stations, and their relations with other agencies, to be printed so that it may be discussed at the next convention.

A resolution by President J. H. Connell providing for a standing committee to investigate and report upon the educational efficiency of the land-grant colleges, in the light of the present and what remains to be done, was referred to the executive committee for report upon at the next meeting.

The association reaffirmed its declaration of last year in favor of federal aid for public schools of secondary grade providing for instruction in agriculture, home economics, and manual training, and for the education and professional training of teachers for these schools in the several States.

On motion of Director C. E. Thorne, the association passed resolutions of congratulation to Secretary James Wilson on his long and successful administration of the Department of Agriculture, and expressed the cordial good wishes of the convention. The appointment of a committee was authorized to wait upon President-elect Wilson and represent to him the interest of the association in the administration and work of the U. S. Department of Agriculture, and express its confident hope that under his administration the relation of the institutions with the Department may continue to be cordial and mutually helpful. The committee designated consists of Dr. W. O. Thompson of Ohio, Dr. W. H. S. Demarest of New Jersey, Dr. C. C. Thach of Alabama, Dean E. Davenport of Illinois, and Director C. D. Woods of Maine.

The convention expressed itself as in favor of providing a permanent official in the Department of Agriculture, to have charge of the scientific work and have the general function of advising in relation to coordination of the scientific and other activities, with a view to emphasizing the permanency of the work and policy of the Department.

Appropriate resolutions were adopted on the death of Dr. M. A. Scovell, a former president and long an active member of the association.

The thanks of the association were extended to Dr. H. E. Stockbridge for his assistance in making local arrangements for the convention and for the entertainment of its members.

The officers elected for the coming year were as follows: President, Dr. E. H. Jenkins of Connecticut; vice presidents, Dean E. Davenport of Illinois, President E. A. Bryan of Washington, President A. M. Soule of Georgia, Dean A. F. Woods of Minnesota, and Director J. F. Duggar of Alabama; secretary-treasurer, Dr. J. L. Hills of Vermont; bibliographer, Dr. A. C. True, Washington, D. C.; executive committee, Dr. W. O. Thompson of Ohio, Dr. D. H. Hill of North Carolina, Dr. E. E. Sparks of Pennsylvania, Dr. W. H. Jordan of New York, and Dr. H. L. Russell of Wisconsin.

Vacancies occurring in the committees were filled as follows: Committee on instruction in agriculture, Prof. J. F. Duggar and Prof. W. H. French; committee on graduate study, Dr. W. O. Thompson and Dr. Brown Ayres; committee on extension work, Prof. Alva Agee and Prof. C. W. Pugsley; committee

on experiment station organization and policy. Dr. E. W. Allen, Prof. B. W. Kilgore, and Director R. W. Thatcher; committee on college organization and policy, President K. L. Butterfield, President J. H. Hamilton, and President W. M. Riggs.

The following were chosen officers of sections: *College section*, President R. A. Pearson of Iowa, chairman, and President Kenyon L. Butterfield of Massachusetts, secretary; *Station section*, Dean A. F. Woods of Minnesota, chairman, Dr. J. G. Lipman of New Jersey, secretary, Mr. W. H. Beal of Washington, D. C., recording secretary, and Prof. B. W. Kilgore of North Carolina, additional member of program committee; *Section on extension work*, Prof. Alva Agee of New Jersey, chairman, Prof. C. W. Fugsley of Nebraska, secretary, and Prof. John Hamilton of Washington, D. C., recording secretary.

SECTION ON COLLEGE WORK AND ADMINISTRATION.

In the section on college work and administration two papers were read: (1) Development of the College and Station News Service, by President R. L. Slagle, and (2) Shall Practical Experience be Required Before Granting the Bachelor's Degree in Agriculture? by Dean E. A. Burnett.

President R. L. Slagle described the news service of the South Dakota College and Station as it has been carried on for one year, consisting of (1) press bulletins, (2) plate service, the college supplying copy and illustrations in the form of stereotype plates to such papers as use such material, (3) special service to papers that do not use plate, consisting of brief popular articles furnished in manuscript form, and (4) special service to daily papers. He also described the features of the news service in a number of other institutions, and called attention to the fact that in Wisconsin and Illinois this service is charged with the editing of station bulletins as well as with the publicity work, while in Kansas and Iowa the publicity work is in charge of departments of agricultural journalism, in which instruction is given to students concerning the preparation of articles for newspapers, reporting, proof reading, etc.

President W. M. Riggs, discussing this subject, called attention to the difficulty of getting the newspapers in South Carolina to publish material contained in their bulletins, and to a scheme adopted of furnishing items concerning their publications to the student correspondents of local papers in different parts of the State. These press notes are mingled with other items in the students' correspondence, and in this way many are published which might otherwise be thrown out.

President Soule described the news service of the Georgia State College of Agriculture, one feature of which is the daily "story" or interview with some college professor which this service gives out to the press.

President E. A. Bryan warned against the danger of misleading the public through the adoption of sensational methods in order to get material published.

Discussing the question Shall Practical Experience be Required Before Granting the Bachelor's Degree in Agriculture? Dean Burnett mentioned two reasons that have been advanced for requiring such experience: (1) That the student who has had farm experience is better able to pursue his college work in agriculture, and (2) that after graduation such a student is better able to understand the problems with which he comes in contact.

Dean Burnett expressed the opinion that farm experience should be required, either in the institution or outside of it. The matter is assuming greater importance of late on account of the large percentage of students from the cities and towns. Of the institutions referred to in his paper, 31 required no farm.

experience, 8 favored it but did not enforce it, and 7 required an examination in the subject, or in lieu of that summer residence at the colleges or on approved farms.

SECTION ON EXPERIMENT STATION WORK.

In discussing Branch Experiment Stations, Dr. H. L. Russell expressed the belief in concentration in station work as far as practicable, but pointed to the frequent necessity for carrying on special work under local conditions, which called for branch stations. The location of substations on a geographical basis was deplored. Unless there is demand for work covering more than one line, substations should not be established but cooperative work and the utilization of temporary facilities should be relied upon.

Work at the branch stations should be supervised by men from the central station representing the several specialties involved. There should not be a high salaried superintendent who is ambitious to develop an independent station. The station should control and own the land it uses rather than lease it. The work there should be primarily experiment and research, although the opportunity may be utilized to demonstrate some facts. A distinction was recognized between branch stations and demonstration fields.

In discussing the paper, Dr. W. H. Jordan regarded permanent substations as uneconomical and their establishment as inadvisable. The problem should govern the activities of the station away from its central location, and it should go where the problem calls, using leased land for such periods as necessary. Dr. Russell pointed out that the problems frequently require the development of the land, introduction of improvements, drainage systems, etc., which implies ownership.

Director F. B. Linfield referred to the differences in climate as requiring local treatment. In a State like Montana he held permanent branch stations to be needed. These are supplemental to the home station and are under its control.

Prof. F. W. Morse described the cranberry and asparagus stations in Massachusetts, the former permanent and the other on a cooperative basis.

Prof. J. H. Shepperd, of North Dakota, outlined the system of branch stations in North Dakota, which are designed to work out special problems of districts, and are under central control and supported by special state appropriations. There are now five of these and there has been a movement for more. The tendency has been to establish more than are actually needed, and they absorb funds that might otherwise come to the state station. To satisfy the demand demonstration farms have been started.

Director C. F. Curtiss held that the substations should be established to extend the facilities for the station's work, and should be located with reference to this, the station determining where it is desirable to reach out.

Director B. W. Kilgore expressed approval of the test farms as conducted in North Carolina. There are five of these, established on the basis of soil and climatic differences. The work done there was considered as profitable as that at the main station. It is planned by the heads of divisions in the central stations, and carried out by a superintendent who works under direction. Often work at the main station is duplicated at one or more branch stations.

Director E. H. Webster considered the five branch stations which have been provided by the legislature in Kansas to be very expensive for the returns that can be secured from them. They were looked upon as a burden; and their existence creates a desire on the part of other localities for a local station.

In a paper on Station Demonstration Farms, Director C. E. Thorne described the four district farms in Ohio. These are a part of the main station, except that they are removed from it by distance. They are directed by the depart-

ments at the station. Two represent different types of soil and two others special crops—tobacco and sugar beets. It has not been found that these stations divert money from the main station, but rather that they stimulate appropriations for the latter by increasing interest. They are used primarily for research, and the demonstration features are purely secondary. The station also has in charge county experimental farms, located by the board of control acting in cooperation with the county commissioners. The latter cooperation has not been found helpful and will be eliminated.

Under the title of County Experimental and Demonstration Farms, Director E. H. Webster outlined the experience in Kansas in attempting to utilize county poor farms for experimental and demonstration work. Twelve of these were operated originally but the number has been cut to three or four, and the work there is at present not active. These farms were not found satisfactory places to work, owing to the conditions surrounding them. In place of this work the station is carrying on cooperative work with about a thousand farmers under a state appropriation of \$7,500 a year. These cooperative fields are directed from the station and are conducted under contract. They are made centers for the community, and are much more satisfactory than the poor farms.

Prof. J. H. Shepperd described a system of twenty-four county demonstration farms which have been running for many years in North Dakota. The station leases from 20 to 25 acres of land, which is divided into plats and run on the basis of a good farming system for the locality. These farms are under the supervision of three men from the station who go about among them, visiting them every week or ten days. The farmer reports daily the weather observations and what he has been doing. Incidentally these farms are helping out the plan for better seed distribution, the station inspecting and certifying the seed grown by the farmers conducting them.

As to the cost of this work, Director A. E. Woods, of Minnesota, stated that it cost the station \$12,000 a year to supervise 40 farms. These are farm management demonstrations, representing different conditions in the State.

The Relation of Farm Management Work to Other Departments of the College and Experiment Station was discussed by Prof. W. J. Spillman of this Department. Farm management, he stated, does not tell how to grow corn or to feed pigs, but whether to grow corn or feed pigs, and how much corn and how many pigs can be grown or fed profitably under existing conditions. Farm management men are dealing with the interrelations of the various farm problems and are endeavoring to answer the questions "what" and "how much?"

In considering the relations between farm management and rural economics, Prof. Spillman pointed out that the farm is the unit of consideration in farm management and it does not, like rural economics and rural sociology, deal with the relations between farms or with relations involving larger units than the farm. In his opinion farm management may be made a subject of investigation or of research work comparable in scientific value to research work in other branches of agriculture.

Prof. G. N. Lauman, in discussing this subject, called attention to the fact that in Europe there is a considerable body of knowledge and published material concerning farm management and rural economics which should be studied by people in this country; and Dean H. C. Price expressed the opinion that rural economics is a general term, of which farm management, rural sociology, and rural economics are parts.

At another session of the section there was a series of three papers on station publications, one relating to the number of series, another to popular bulletins, and a third to the station mailing list.

In a paper on Station Publications, How Many and What Series? Dr. E. W. Allen called attention to the wide variation in the character of station publications and the desirability of restricting them to the present field of the stations. Viewing the experiment station as an institution or department for acquiring and testing knowledge in its relation to agriculture, as differentiated from the extension and teaching service, the issue of four separate series of publications was recommended: (1) Technical or research bulletins, devoted to reporting the more technical work of the station which is not of immediate interest to the general public, (2) regular bulletins reporting the results of the station's experiments and investigations in so far as they are of general interest, (3) circulars, to serve as a less permanent or briefer means of communication, and (4) the annual report or résumé of progress.

All of these should be the product of the station's work, and should report its activities and its findings. "The clearer definition of function between the experiment station, the college, and the extension department has prepared the way for a closer restriction of station publications to a discussion of findings and their application." This would not exclude popular accounts of the station work, but would not include the compilations based largely on common sources of information. The matter should be so presented that it will be evident to the reader what new contributions are involved and how much of credit for originality is due.

The Purpose and Preparation of Popular Bulletins was discussed by Mr. F. H. Hall, who described the series of popular editions put out by the New York State Station. In New York the popular edition has made the bulletins much more effective, and satisfies the demand of a large proportion of people. Where the full bulletin is desired it is sent. A considerable yearly saving was calculated from the issue of the popular edition, and the editor who prepares these bulletins also has time to attend to the editing and proof reading of the regular editions.

The Station Mailing List was considered in a paper by Director A. F. Woods. Information had been collected on a questionnaire in regard to the number of series of publications issued, the handling of the mailing lists, and method of distribution. The classification of mailing lists was found to be on a variety of bases—according to different series, by subject, by geographical location or section, etc. The plan of classifying the mailing list by subjects was found to be on the increase and was heartily endorsed by many as avoiding a considerable waste of bulletins. Where stations issue a considerable number of bulletins it was advised to substitute the mailing machine for hand labor. Different classes of machines for accomplishing this were described.

At a joint session of the section with the section on college work and administration, a historical paper by Dean Eugene Davenport on the American Agricultural College was read. This paper has been referred to editorially in a previous issue.

SECTION ON EXTENSION WORK.

The subject of Training Extension Workers was discussed by Prof. W. D. Hurd and Prof. Alva Agee. The first speaker held extension teaching to be a form of education, on a par with and worthy of classification with the older recognized forms of instruction; and that the men who are to teach in this department must possess as high qualifications as any who give instruction to resident students.

He must not only be qualified as a teacher but also possess organizing ability of high order, and be expert in judging men,—having tact, common sense, and

appreciation of the difficulties that rural people have to meet. He must know his subject, should have college training, must be a specialist, and have had successful experience in the line of work he is undertaking to teach.

The second speaker called attention first of all to the kind of man that the "trainer" should be—that the trained man was a product, and that back of him was the expert who fitted him for his work. This trainer should be a man of large experience, should believe in agriculture, should be possessed of high character, and also be a scholar of acknowledged ability in directions other than agriculture. He should be capable of producing a skilled worker in a reasonable length of time, out of material of fair quality and which has had suitable previous training.

In a general discussion of Special Trains as a Means of Extension Teaching, the value of instruction trains was generally attested, but it was felt that to be most beneficial they should be followed up by some more permanent form of teaching, as the movable school, the local adviser, the demonstration in field, orchard, or barn. The consensus of opinion seemed to be that a single-topic train was most effective, particularly after the people had been aroused by those of a more general character.

The following points were brought out: It is best for the instruction force to control the train rather than the railroad company; strict discipline should be maintained while the train is out; all exhibits excepting those illustrating the teaching should be excluded; a bulletin giving a synopsis of the address made should be put in the hands of every person present; a proper period for the stops for a single-topic train is about one and one-half hours.

It was recommended that the same lecture be delivered in each car so that all may have opportunity to get the information. When a train is late or behind its schedule, the address of each speaker should be cut until the time is made up, rather than to omit entirely one or more of the addresses from the schedule. What each man shall teach should be prescribed so as to insure harmony in the facts presented.

A round-table discussion was held upon What the Extension Departments can do to Forward Industrial Education in the Public Schools. It was suggested that lecturers could be sent to give instruction in teachers' institutes, and that suitable publications could be prepared and issued for distribution among the teachers in schools giving information as to the method of teaching agriculture to country children. Teachers should also be invited to attend the summer short courses at the college, and possibly district short courses could be organized for teachers in the various sections of the State.

JOINT SESSION.

A symposium on Cooperation in Extension Service Between the United States Department of Agriculture and the Agricultural Colleges, held at a joint session of the experiment station and extension sections, developed considerable difference of opinion as to the extent and the character of such cooperation, and a noticeable apprehension over the recent extension of this activity in the northern States.

Dean F. B. Mumford maintained that agricultural extension is a work to be carried on by the State, and that if the Department comes into the State at all to take part in such work it should be to assist the institutions rather than to work independently or to conduct separate enterprises. This view received considerable support.

Director C. E. Thorne and President H. J. Waters dwelt on the possibility of cooperation to a rather large extent, and gave illustrations of the advantages to be derived. They felt, however, that the state institutions should be fully recognized in extension enterprises within the State, and that their position of leadership should not be interfered with.

The present plan of the Department for conducting field work in extension and demonstration was described in a paper by Dr. B. T. Galloway, read by Mr. W. A. Taylor, of the Bureau of Plant Industry. This led to a discussion of the farm management work and the establishment of local or county agents in the various States. It was maintained that this is to be done only in cooperation with the agricultural colleges, whose advice and collaboration will be sought, whether or not they have funds which are immediately available to contribute toward the undertaking.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The organic-phosphoric acid compound of wheat bran, R. J. ANDERSON (*New York State Sta. Tech. Bul.* 22, pp. 2-16).—The chief purpose of this work was to determine the nature of the organic phosphorus body removed from wheat bran by extraction with a dilute acid and to determine what bases are associated with it. As a result of examining the organic phosphorus compound none of the salts characteristic of phytic acid could be isolated.

"The purified barium salts of the compound corresponded to the following formulas: $C_{22}H_{42}O_{10}P_2Ba_2$ and $C_{22}H_{40}O_{10}P_2Ba_2$. Attempts to isolate the free acid corresponding to the first salt did not succeed. From both salts the same acid, corresponding to that of the second salt, $C_{22}H_{40}O_{10}P_2$, was obtained. This acid is apparently formed from the first by the splitting off of the elements of one pentose. Crystalline salts of the acid $C_{22}H_{40}O_{10}P_2$ with inorganic bases could not be obtained. A crystalline brucin salt $C_{22}H_{40}O_{10}P_2(C_{22}H_{12}O_5N_4)_6 + 30H_2O$ was easily formed. Since all the purified barium salts prepared under different conditions, either from the previously isolated crude substance or from the bran extract itself, could all finally be changed into salts of the acid $C_{22}H_{40}O_{10}P_2$ under liberation of reducing substances, the conclusion seems justified that this acid is the only organic phosphoric acid present and that wheat bran does not contain phytin."

"The 0.2 per cent hydrochloric acid extract of bran contains some dissolved proteins. On precipitating with alcohol these are thrown down together with the phosphorus compounds. Their presence makes the subsequent purification difficult, especially the filtrations, because the proteins have been rendered more or less insoluble and form a fine slimy mass which clogs the filter paper to such an extent as to make filtration even by suction extremely tedious."

In order to obviate this the bran extract was first treated with tannic acid. "The addition of tannic acid caused a voluminous and very fine precipitate which after standing a short time became coarser and was easily removed by simple filtration. The resulting filtrate is nearly colorless or of light amber color. Alcohol produces in this solution a nearly colorless precipitate which is much more easily purified than the product obtained without first precipitating with tannic acid."

"With only this modification some of the substance was prepared from wheat bran. It was found, however, to differ slightly in composition from that obtained by the first method. On analysis the following results were obtained: Carbon 19.51, hydrogen 3.09, phosphorus 15.23, calcium 0.33, magnesium 7.35, potassium 2.75, and nitrogen 0.57 per cent. On treating this substance with barium hydroxide and purifying the resulting precipitate in the same way as before the same barium salt was obtained: For $C_{22}H_{40}O_{10}P_2Ba_2=2184$. Calculated carbon 13.73, hydrogen 2.51, phosphorus 12.76, barium 31.44 per cent. Found carbon 13.00, hydrogen 2.40, phosphorus 12.47, barium 33.90 per cent. The difference in composition of the crude substance must therefore be due to the smaller amount of the nitrogen-containing body which this preparation

was found to hold. In the analysis of the crude substance only 0.57 per cent nitrogen was found, whereas the first preparation had four times, and the second preparation two times, as much."

The author expects to carry out a complete investigation of the organic phosphorus body of wheat bran, especially to isolate and to identify the reducing bodies which are formed as a result of cleavage with dilute acid. He is also to take up the study of the nitrogen-containing substance mentioned above.

Investigations in regard to colostrum, A. BUER, F. M. BERBERICH, and A. BRAG (*Molk. Ztg. [Hüdenheim]*, 26 (1912), Nos. 43, pp. 799, 800; 46, pp. 851, 852).—This is a chemical and physical study of colostrum. Many of the newer methods now employed in milk chemistry were applied.

Note on the refractivity of the products of the hydrolysis of casein, and a rapid method of determining the relative activity of trypsin solutions, T. B. ROBINSON (*Jour. Biol. Chem.*, 12 (1912), No. 1, pp. 23-29).—It is shown that the hydrolysis of sodium caseinate by trypsin does not alter the refractivity of the solution within the limits of accuracy of the determination. A method for comparing the activity of trypsin solutions, based upon this principle, is given in detail.

Laboratory studies of rennin, A. ZIMMERMAN (*Abh. in Science, n. ser.*, 35 (1912), No. 897, p. 382).—This work considers the following points: "The variation in the length of time required to curdle different specimens of milk by rennin and how this is influenced by the milk, according to the length of time it is kept after the milking; standardizing rennin to use as a control in rennin assay, for more accurate results; the acceleration of the action of rennin upon milk by phosphoric acid; the effect of alkalis upon milk, causing a variation of the length of time required to curd the milk by rennin; the influence of heat in changing the acidity of milk, kept for a varied number of hours after the milking."

In regard to the inhibition of rennet action, S. G. HEDIN (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 76 (1912), No. 5-6, pp. 355-368; *abs. in Chem. Zentbl.*, 1912, I, No. 16, p. 1322).—By treating with ammonia a neutral infusion obtained from hogs' stomachs a substance is obtained which inhibits rennetic activity of hog stomach extracts but does not influence other rennet preparations. This inhibiting property was found to remain in part after boiling the infusion. If the zymogen obtained by the ammonia method is neutralized with dilute hydrochloric acid the solution is found to contain active free rennet, but if the solution is treated with hydrochloric acid after it is boiled the inhibiting power is not lost. When the original zymogen infusion is treated with hydrochloric acid and neutralized, whereby the rennet is activated, and then treated with ammonia and neutralized, no inhibiting substance is obtained. Calves' rennet on being boiled yields an inhibiting substance which, however, is not specific and does not exhibit the usual properties mentioned above. Rennet obtained from the guinea pig and the pike, when treated in the above manner, showed no inhibiting qualities.

In regard to cellulase, H. EULER (*Ztschr. Angew. Chem.*, 25 (1912), No. 6, pp. 250, 251; *abs. in Zentbl. Biochem. u. Biophys.*, 13 (1912), No. 5-6, p. 231).—The cleavage of cellulose by enzymes has not been definitely established on account of the fact that questionable substrates like hemi-, oxy-, and hydro-cellulose have been used. It is believed that better results may be obtained by using cellulose-dextrin. This is prepared by treating Swedish filter paper with a 75 per cent solution of sulphuric acid at 30° C. for 6 hours, removing the acid by precipitation, dialyzing the resulting filtered solution, and concentrating the dialyzed solution until it contains about 7 per cent of total solids (providing no

sugar and ash are present). Some tests with this compound and the press juice from the mycelium of *Merulius lacrymans* are reported.

Tests in regard to the origin of aldehyde-catalase and the possibility of using the results of the same for certain purposes, G. SALUS (*Arch. Hyg.*, 75 (1912), No. 8, pp. 371-382).—Tests conducted with press juices and dry tissue obtained from the mammary gland of cows and also with whole milk show that reductase (aldehyde-catalase) is probably a product of cellular activity and is closely connected with the process of milk formation. A possibility also exists that the results obtained from the reductase test will serve as a quantitative expression as to whether or not a cow is a good milk producer.

Saccharification of starch by hydrogen peroxid alone or in the presence of plant or animal amylases, C. GERBER (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 23, pp. 1543-1545).—The hydrolysis of starch by hydrogen peroxid simulates that brought about by enzymes, i. e., first maltose and then the remainder of the cleavage products are produced. The hydrolytic process proceeds very rapidly and its rate is in proportion to the degree of heat applied. Small amounts of hydrogen peroxid were found to act diversely upon the saccharification produced by amylases (*Picus carica*, *Broussonetia papyrifera*, and trypsin). Amylase was found to possess various degrees of resistance toward hydrogen peroxid, much depending upon the source of the enzyme.

Neutral ammonium citrate solution, A. J. PATTEN and C. S. ROBINSON (*Jour. Indus. and Engin. Chem.*, 4 (1912), No. 6, pp. 443-446, figs. 2).—Previously noted from another source (*E. S. R.*, 26, p. 98).

Note in regard to the qualitative detection of nitric acid in the presence of an excess of nitrous acid, H. K. SEN and B. B. DEY (*Ztschr. Anorg. Chem.*, 74 (1912), No. 1, pp. 52-54; *abs. in Chem. Zentrbl.*, 1912, I, No. 15, p. 1250).—The method is based on the fact that hydrazin sulphate reacts with nitrous acid without affecting any of the nitrate which may be present in the solution. In some tests with pure recrystallized sodium nitrite and hydrazin sulphate no blue coloration was obtained with diphenylamin at the end of the reaction, while in some tests with the urea method nitric acid was noted. The hydrazin method is therefore to be given the preference over the urea method.

The determination of nitrates and nitrites in drainage and rain waters by Schlösing's method, A. HUIZINGA (*Ztschr. Analyt. Chem.*, 51 (1912), No. 5, pp. 273-292).—It is stated that the results obtained with the old method (evaporation with magnesia and treating the gas obtained with sodium hydroxid) are not always correct, because of the presence of nitrites in the water under examination. To obviate these errors the following recommendations are made: (a) The fluid should be evaporated after it has been treated with a potassium hydroxid solution. (b) The treatment of gas with sodium hydrate can be dispensed with if the carbonates are destroyed previous to evaporation. Any nitrite which may remain after the oxidation of the organic substance can be removed by oxidation with permanganate in an acid solution. The method for doing this is described.

Determination of humus, especially in heavy clay soils, W. BEAM (*Cairo Sci. Jour.*, 6 (1912), No. 68, pp. 93-103).—"In the case of heavy clay soils and especially those containing little organic matter, washing with water until the filtrate is neutral can not be relied upon to remove the excess of hydrochloric acid remaining after the extraction of the calcium. The form of filter best suited to the complete removal of the acid, and also to the ready and complete extraction of the humus by ammonia, is that furnished by a Büchner funnel and the use of a layer of asbestos as well as a supporting disc of paper. The soil should be mixed with sand and the mixture covered by a layer of sand and a protecting disc of filter paper. The removal of the hydrochloric acid is best

accomplished with a cold solution of carbon dioxide, in order to avoid puddling the clay. In cases in which the humus is very low, the use of carbon dioxide water and the filter described above was found to be the only practicable method of carrying out efficient filtration. Complete extraction of humus from soil can only be accomplished by repeated treatments with the ammonia solution. Methods depending upon a single extraction with a measured volume of ammonia yield results below the truth. The removal of clay from suspension in humous solution is readily accomplished by the use of ammonium carbonate, as suggested by Rather, but the clay so precipitated carries with it a portion of the humus.

"With suitable precautions the use of ammonium carbonate offers a reliable and satisfactory method for removing the clay from the humus solution. For the reasons given above the modified 'official' method suggested by Rather, may, in the case of soils poor in humus, give results as much as 50 per cent below the truth. Unless the greatest care is taken to avoid too long heating of the dried humus residue, and frequently notwithstanding such care, the Moers-Hampton method fails when applied to Nile soils. Complete solution in ammonia, after evaporation to dryness, can not always be effected."

A method for the colorimetric determination of humus recommended by the author is as follows: "The equivalent of 5 gm. of the dry soil is placed in a Gooch crucible with asbestos filter and extracted with 1 per cent of hydrochloric acid until the filtrate is free from calcium. The soil is then conveyed, without washing with water, to an enameled iron cup, and boiled up for 10 minutes with 5 per cent sodium carbonate solution. During the boiling it is well to cover the cup with a flask filled with cold water. At the end of 5 minutes the flask is removed and the contents of the cup well mixed. The cup is then covered and the boiling continued for the remaining 5 minutes. The liquid is allowed to cool, after which it is made up to 250 cc., mixed, and centrifuged or allowed to stand over night. The practically clear supernatant liquid is then decanted through an asbestos filter in a Gooch crucible. The comparison is made with a soil of known humus content which is treated in the same way. The color of the humus solution is one which permits of very accurate estimation."

Method for ashing foodstuffs and other organic substances for the purpose of making a determination of phosphoric acid in the same. A. VOZÁRIK (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 76 (1912), No. 5-6, pp. 426-432; *abs. in Zentbl. Biochem. u. Biophys.*, 13 (1912), No. 5-6, pp. 188, 189).—For determining the phosphoric acid content of foods, etc., the author proposes the following ashing method:

From 1 to 3 gm. of finely powdered material is placed in a platinum crucible containing 0.2 gm. of finely powdered magnesium oxid, mixed with a glass rod, and then heated until the mass is completely carbonized. The Bunsen flame during the process is directed toward the rim of the crucible and the heating is so conducted that the destruction of the organic substance is uniform. Substances of animal origin require between $\frac{1}{2}$ and 2 hours, plant material from 2 to 3 hours. The phosphoric acid can then be determined either volumetrically or gravimetrically.

In regard to the titration of phosphoric acid with a uranium salt in foods and other organic substances and the errors in the method, A. VOZÁRIK (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 76 (1912), No. 5-6, pp. 433-456; *abs. in Zentbl. Biochem. u. Biophys.*, 13 (1912), No. 5-6, p. 189).—The solution to be titrated must contain no phosphate which gives an acid reaction with phenolphthalein and no aluminum iron phosphate. The presence of free acetic acid is also detrimental, and its activity begins when an amount of 0.36 per cent and

the indicator cochineal is employed, and 0.6 per cent when potassium ferrocyanid is used as the indicator. Sodium, ammonium, and magnesium acetates in amounts of from 0.42 to 0.75 per cent show detrimental effects. Mineral acids with cochineal give high results for the titration, while those obtained with potassium ferrocyanid will be low.

Inorganic phosphorus in plant substances: An improved method of estimation, R. C. COLLISON (*Jour. Biol. Chem.*, 12 (1912), No. 1, pp. 65-72).—In all probability some of the failures to demonstrate the presence of inorganic phosphorus in seeds are due to imperfections in the analytical methods. Phytin, for instance, when present has an influence upon the precipitation of phosphorus. As shown in previous work some of these difficulties may be removed by the method of Forbes et al. previously reported (*E. S. R.*, 23, p. 303), which avoids the necessity of precipitating the phosphorus in the presence of protein and salts of phytic acid. With the method appreciable quantities of inorganic phosphoric acid were found in oats, wheat, and corn seeds, soy beans, cowpeas, rice polish, alfalfa hay, and blue grass.

When the extracts were from materials low in organic matter (hays, etc.), the results were satisfactory, but where much organic matter was present, as is the case with extracts of legumes, the solutions were extremely difficult to filter and the results were high. In some instances, however, the results were low because of the influence which the organic substances present exerted upon the precipitation of the magnesium ammonium phosphate. With a view of obviating the above errors the method has now been improved and is as follows:

"A 10 gm. sample of the substance, very finely ground, is placed in a 400 cc. flask and covered with exactly 300 cc. of 94 to 96 per cent phosphorus-free alcohol, which contains 0.2 per cent of hydrochloric acid (calculated from the percentage of hydrochloric acid in the concentrated acid). The flask is shaken at intervals of 5 minutes for 3 hours. The extract so obtained is then filtered through dry, double 11 cm. filters into dry flasks. No suction is necessary. An aliquot of 250 cc. of this filtrate is placed in a 400 cc. beaker and made just alkaline to litmus paper with ammonia. A slight excess of ammonia does no harm. The solutions are allowed to stand from 8 to 12 hours or over night and then filtered through double 11 cm. filters, care being taken to decant the clear liquid as far as possible.

"The precipitate is then transferred to the filter and washed with 94 to 96 per cent alcohol, which has been made just ammoniacal. In transferring the precipitate some of the material may stick very tenaciously to the beaker. In this case, after cleaning the beaker fairly well, add 5 drops of hydrochloric acid to the beaker, rub out the latter with a rubber tipped rod, add 10 cc. of alcohol and then make just alkaline with ammonia and transfer this last portion to the filter. In this way the last traces of the precipitate can be easily removed.

"After washing several times, the inner filter with the precipitate is spread out and allowed to dry completely. It is then transferred to an Erlenmeyer flask containing exactly 100 cc. of 0.5 per cent nitric acid in water (calculated from the percentage of nitric acid in the concentrated acid). The flask is stoppered and the contents thoroughly shaken until the paper and precipitate are broken up. It is best to let it stand for some hours. The material in the flask is then filtered through dry, double 11 cm. filters into dry beakers and exactly 75 cc. of the filtrate precipitated with 50 cc. of official acid molybdate solution in the usual way; 10 gm. of ammonium nitrate and 2 hours' digestion at 60° C. are usually sufficient. The final results represent the amount of inorganic phosphorus in 6.25 gm. of the original sample.

"It is advisable to reprecipitate the pyrophosphate if the final solutions are highly colored, which is sometimes the case with some of the rough feeds, as the hays. In the case of such substances, which are relatively high in inorganic phosphorus, a smaller sample may be taken, 3 to 6 gm. In using this method with substances which are tenacious and gummy, and which do not break up readily in acid alcohol, as is true of dried fruits and other substances containing considerable sugar, the same may be worked up with sand and a definite quantity of water; 15 to 20 cc. are usually sufficient. This may be done in a mortar and the material washed out into the flask with acid alcohol, care being taken to use the correct volume, namely, 300 cc. minus the quantity of water used. This method defloculates substances the most refractive in this regard."

The results of some tests with the method and cereals, legumes, hays, etc., with and without the addition of extraneous inorganic phosphates, are reported.

A method for the determination of the specific gravity of wheat and other cereals, C. H. BAILEY and L. M. THOMAS (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 39, pp. 7, fig. 1*).—This method is based on the displacement of toluene by a weighed portion of the grain in question, and is described in detail. A special form of pycnometer is used for this purpose, and is illustrated.

The use of the quantitative precipitin reaction for examining honey, J. THÖNI (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gesundheitsamt., 3 (1912), No. 2, pp. 74-94*).—Continuing previous work (E. S. R., 23, p. 505) the author has studied this reaction with heated honeys, and also the variations which may take place in the amount of precipitate produced when the same antiserum is employed with authentic honeys. In addition to this, some biological analyses (diastase and catalase) of adulterated, denaturalized, and so-called feed honeys are reported, and the Flehe reaction was also applied.

The figure for the quantity of precipitate was found to be only relative. When the same antiserum was employed the results were comparative, but it differed when another antiserum was used. Honeys heated to near the boiling point of water showed a decrease in the amount of precipitate produced by the antiserum. If the heating was continued to the boiling point and maintained there for 1 hour no precipitate was produced.

Determination of sucrose in cane molasses: Use of hydrochloric acid and urea, of sulphurous acid, and of acetic acid, H. PELLER (*Internat. Sugar Jour., 14 (1912), No. 162, pp. 332-334*).—In order to obtain correct results by the optical inversion method it is necessary to conduct the direct polarization under such conditions that on inversion with hydrochloric acid the difference of rotation is due only to inverted sucrose. The polarization before inversion must be made at the same degree of acidity which is to prevail after inversion. This can be accomplished with the urea and hydrochloric acid method, and also with the sulphurous acid method under certain conditions. Acetic acid is too weak a reagent and only destroys the influence of the basic lead acetate used for clarification without affecting the levulose. The results obtained before inversion are not comparable with the polarization after inversion; hence, the figures found for sucrose can not be considered accurate when acetic acid is employed.

A quick method for detecting salicylic acid, L. STÖCKLIN (*Ann. Falsif., 5 (1912), No. 53, pp. 220-223*).—A small quantity of the material to be examined is extracted at ordinary temperature with 10 cc. of ethylene dichlorid without strong agitation. (If too strongly shaken emulsification will take place.) The ethylene dichlorid extract, which contains the salicylic acid, is washed with water

by decantation, the solvent evaporated, and the Jorissen test for salicylic acid applied. The ferric chlorid test can be used directly with the washed ethylene dichlorid solution containing salicylic acid.

The determination of tartaric acid, P. B. DUNBAR (*U. S. Dept. Agr., Bur. Chem. Circ. 196, pp. 9, fig. 1*).—As the procedure proposed by Yoder for the determination of malic acid (*E. S. R., 24, p. 612*) could not be applied successfully to the estimation of tartaric acid, a study was made of the conditions under which the effect of uranyl acetate on the rotation of this acid would be proportional to the amount of acid present in a given solution. This was found to be, in solutions containing from 0.2 to 3 gm. of tartaric acid in 100 cc., although the most favorable concentration was between 0.5 and 2 gm. per 100 cc. Solutions containing as low as 0.2 gm. per 100 cc. could be used, but often the color of the solutions interfered with the reading. It was also found necessary to precipitate tartaric acid from solutions containing other optically active substances affected by uranyl acetate. This was done with dry powdered normal lead acetate, the excess of lead being removed with anhydrous sodium sulphate. The ratio of tartaric acid concentration to rotation determined was 0.051, obtained by treating solutions of the acid with uranyl acetate, determining the rotation in degrees Ventzke, and dividing the number of grams of acid in the solution by the rotation. The details of the method are as follows:

"(1) Measure 85 cc. of the solution under examination into a 100 cc. graduated flask, render the solution slightly alkaline to litmus paper with sodium hydroxid, add 5 gm. of sodium acetate and shake until dissolved. Reacidify the solution to litmus paper with a strong solution of citric acid, adding a slight excess of the acid, cool to room temperature, and dilute to 100 cc. Treat about 30 cc. of this solution with powdered uranyl acetate, transfer to a suitable container, and shake for 3 hours with a mechanical shaker. Add enough uranyl acetate so that a small amount remains undissolved after 3 hours' shaking; from 2 to 3 gm. is usually sufficient. If the uranium salt dissolves, more must be added. Filter through a folded filter and polarize, if possible in a 200 mm. tube. After polarizing, agitate the solution for an hour longer with uranyl acetate and again polarize to determine whether a maximum rotation has been obtained. Calculate the reading in degrees Ventzke to the basis of the original solution and designate as (1).

"(2) Treat about 50 cc. of the original solution with dry powdered normal lead acetate until no further precipitation results; avoid excess of the precipitant. A centrifuge can be used to advantage in settling the precipitate. Filter through a folded filter and test the filtrate with a small crystal of lead acetate to determine whether precipitation is complete. Remove the excess of lead with powdered anhydrous sodium sulphate, filter until clear, and polarize in a 200 mm. tube. Designate this reading as (2). If the solution is supposed to contain less than 0.5 per cent of tartaric acid and more than 10 per cent of sugar, treat the tartaric acid free solution with powdered uranyl acetate and shake at intervals for 1 hour. Filter and polarize. If the reading so obtained is less than (2), it should be used instead of (2) in the final calculation.

"(3) Polarize at room temperature with white light, taking care that all solutions are polarized at the same temperature. Make at least 6 readings on each solution and take the average of these. Calculate all readings to the basis of a 200 mm. tube. Multiply the algebraic difference in degrees Ventzke between readings (1) and (2) by the factor 0.051. The result will equal the weight of total tartaric acid in grams in 100 cc. of the original solution.

"In this work a standard Lippich type, triple-field saccharimeter was used, the light being furnished by an electric stereopticon bulb placed behind a ground-glass plate. . . . After reaching a maximum, the rotation of the uranium-tartrate solution remains constant and solutions may be kept overnight before polarizing. They must be kept in a dark place, however, as they are darkened by exposure to daylight."

Large amounts of pectin bodies when present may be removed by precipitation with from 2 to 3 volumes of alcohol, washing the precipitate with 95 per cent alcohol and then concentrating the filtrate to its original bulk. Di-sodium phosphate and ferrous sulphate when present in the solution had no effect upon the results, but potassium alum did.

Tests made with sugar solutions and fruit juices (strawberry, raspberry, and blackberry), containing known amounts of added tartaric acid, showed that the results obtained with blackberry juice and the lower concentrations of raspberry juice varied most widely from the theoretical figures. This was probably due to the high color which the solutions had, but attempts to obviate this difficulty resulted negatively.

The determination of malic and tartaric acids in the same solution, P. B. DUNBAR (*U. S. Dept. Agr., Bur. Chem. Circ. 105*, pp. 8).—The purpose of this paper was to present some preliminary notes on a new method for the determination of malic and tartaric acids in the same solution. In the experiments advantage was taken of the fact that malic and tartaric acids, like lactic acid, are converted quantitatively into oxalic acid by oxidation with potassium permanganate (*U. S. R., 25*, p. 24), and furthermore that solutions of both malic and tartaric acids, when treated with uranyl acetate, show an increased rotation, which within certain limits is proportional to the concentration.

Accordingly, "knowing the total rotation produced by these acids on treatment with uranyl acetate and either the amount of oxalic formed by oxidation or the amount of potassium permanganate reduced, it is possible to calculate the amounts of malic and tartaric acids present in a solution. The presence of substances which form oxalic acid on oxidation and which can not be removed before treatment with potassium permanganate interferes with the method."

The determination of arsenic, C. R. SMITH (*U. S. Dept. Agr., Bur. Chem. Circ. 102*, pp. 12, figs. 2).—"The methods here recommended are concerned with the estimation of amounts of arsenic, ranging from 1 micromilligram to 10 or more milligrams, and include particularly various modifications of the Sanger-Black-Gutzelt determination of arsenic which seem to improve its accuracy and practicability, new methods for measuring of the arsenic from comparatively large amounts of arsenic, and a new method for the quantitative separation and concentration of varying amounts of arsenic from large quantities of organic and inorganic materials, including in particular the separation from antimony and tin."

Peanut butter, W. R. BEATTIE (*U. S. Dept. Agr., Bur. Plant Indus. Circ. 98*, pp. 4, figs. 7).—This circular describes the manufacture of peanut butter, under the headings of the stock, factory and equipment, roasting, blanching, blending, grinding, and bottling and packing.

Distillation of resinous wood by saturated steam, L. F. HAWLEY and R. C. PALMER (*U. S. Dept. Agr., Forest Serv. Bul. 109*, pp. 31, figs. 7).—Although a large number of plants have been built for producing crude turpentine by distillation with steam from sawmill waste or light wood, or both, many of them have been abandoned, probably because the turpentine was the only product obtained or the amount of crude turpentine obtained was lower than that produced by other processes. The quality of the turpentine produced by this

method is good and the process seems to be very promising when combined with others for "the utilization of the steamed chips, as, for instance, for the extraction of the resin with volatile solvents. The process might be favored, also, where the material would be largely used as fuel, or wasted, or where it is very cheap, or so poor in quality that more complicated processes would not be profitable. These conditions generally obtain with the waste wood of saw-mills now used as fuel at the plant or burned on the rubbish pile. In these fields the steam distillation of resinous woods will undoubtedly expand.

"There has been no uniformity in commercial practice nor in the opinions of the various operators as to the proper steam pressure, size of chips, or rapidity of distillation, and no experimental data have been published on the effects produced by these various, readily controlled variables."

"In this study of the distillation of resinous wood by saturated steam the effects of different variables have been considered: (1) Size of chip, (2) pressure of steam, (3) speed of distillation, and (4) end point at which distillation is stopped, on (a) the yield of total oil, (b) the composition of the oil, and (c) the amount of steam required to remove the oil. It can be seen that there should be a certain combination of values for these variables which would give the most economical method of operation for a steam distillation plant; but there are other factors which must be taken into consideration in determining the proper combination of values. For example, the best size of the chip will not be determined entirely by the effect of size on yield and efficiency, but also by the relative costs of preparing different sized chips and the use to which the chips are to be put after steaming; the best pressure of steam will not be determined entirely by the effect of pressure on yield and efficiency, but also by the relative costs of high and low pressure steam and of apparatus for various pressures; the best speed for the distillation will not depend entirely upon the effect of speed on the yield of products and on the amount of steam required, but also upon the cost of steam and the overhead charges; the best end point at which to stop the distillation will not depend entirely upon the effect of end point on yield and efficiency, but also upon the cost of the raw material and the value of the products.

"With the experimental data given, however, and with a knowledge of the various cost factors, which would naturally differ widely in different plants, it will be possible to decide readily on the most economical methods of operating."

METEOROLOGY—WATER.

Colorado climatology. R. E. TRIMBLE (*Colorado Sta. Bul.* 182, pp. 56).—This bulletin summarizes meteorological observations which have been made for a number of years by the station at Fort Collins, at the substations at Rockyford and Cheyenne Wells, and at Longs Peak in Estes Park and Cowdrey in North Park. The climatic characteristics indicated by these and other observations are discussed.

"Nearly all the variations of a continental climate are to be found within the borders of the State of Colorado. The natural diversities which result from its location in latitude and the many variations caused by the difference in topography, the effect of the Rocky Mountains extending through the State, are well defined in many cases and cause many complex effects. Many important local features are not apparent in the averages of the principal atmospheric conditions which make up what is known as 'climate.' Two-fifths of the State is highly mountainous, and the rest of it plains and high mesas. About 40 per cent of the area is above 7,000 ft. in elevation. That portion of the State lying east of the mountains, or the plains region, is crossed by a

ridge which forms the watershed between the South Platte and the Arkansas rivers. The lowest point in the State is where the Arkansas River leaves the State a few miles below Holly, at an altitude of 3,370 ft., while Julesburg, 3,490 ft., on the South Platte, is the lowest point in the northeastern portion of the State. . . .

"The mean temperature of the State as a whole is 45°, and the average precipitation 15.90 in. . . . The usual track of storms being some distance northward, the State is generally dominated by the warm and dry quadrants of the low areas that move eastward with great regularity, and escapes in part the attendant precipitation of moisture, the high wind movement, and the sharp fluctuations of temperature. . . .

"The continental divide is also effective in moderating the winter temperatures of the eastern slope. When the distribution of the pressure is favorable to westerly winds, remarkable rises of temperature occur. These are called 'chinook' winds. . . . Chinooks are liable to occur at all seasons of the year, but the warmth is relatively greater in winter and therefore more noticeable when the mountain region is warmer in comparison with the plains than in summer, adding extra heat to the descending air."

The climate of Wisconsin and its relation to agriculture, A. R. WHITSON and O. E. BAKER (*Wisconsin Sta. Bul. 223, pp. 65, pl. 1, figs. 25*).—This bulletin is divided into three parts, dealing with (1) general principles of climate, (2) special conditions of climate and weather in Wisconsin, and (3) the relation of climate to the agriculture of the State.

It is stated that "the mean annual temperature for the eighty-odd stations scattered throughout Wisconsin is 43.3°. This average temperature varies from 48° for the southwest corner of the State to 39° for the northeast portion. . . . The mean winter temperature for the whole State is 17° (December 20°, January 14°, February 16°), ranging from 23.6° at Racine to 12.9° at Hayward. The mean spring temperature is 42° (March 29°, April 43°, May 55°), ranging from 47.4° at Dubuque to 37° at Bayfield. The mean summer temperature is 67° (June 65°, July 69°, August 67°), ranging from 71.4° at Prairie du Chien to less than 60° upon the outer Apostles' Islands. The mean fall temperature is 47° (September 60°, October 48°, November 33°), ranging from 52° at Racine to 43° at Butternut.

"The northern portion of the State averages about 8° cooler in winter than the southeastern portion, about 5° cooler in spring, about 4° cooler in summer, and about 6° cooler in fall. . . .

"The coldest temperature reached in the average winter varies from 15° below zero along Lake Michigan south of Sheboygan, to 35° and 40° below zero in the interior northwestern portion of the State. The highest temperature ever recorded in the State was 111° at Broadhead, Green Co.; and the lowest, 50° below zero, at Hayward and also at Mauston. . . .

"The length of time from frost to frost varies as widely in Wisconsin as in any other eastern State, ranging from 175 days at Dubuque to 75 days on the Iron ranges along the Michigan border."

There is shown to be a marked effect of elevation and lake influence on length of growing season. "Whereas the five Michigan shore stations at Racine, Milwaukee, Sheboygan, Manitowac, and Kewaunee show an average season of 171 days, the five highland stations at Darlington, Mt. Horeb, Hillsboro, Hatfield, and Neillsville, lying at corresponding latitudes, average only 130 days. Similarly, the average growing season for Duluth, Superior, Bayfield, and Ashland is 130 days; while the average of the northern highland stations at Solon Springs, Hayward, Butternut, and Vaudesare, though located further to the south, is 95 days. . . .

"The distribution of the rainfall over Wisconsin is remarkably uniform. All but four of the eighty-odd stations show an average yearly rainfall of 28 to 34 in., while the mean for the whole State is 31 in. . . . The local distribution of rainfall varies, however, from year to year, some sections receiving more rainfall one year, and other sections more in other years." In seasonal distribution "Wisconsin is unusually fortunate, since about half of the total rainfall comes in May, June, July, and August, and nearly 70 per cent from April to September, inclusive. June has the heaviest rainfall, averaging 4.1 in., while July averages 4 in. and May 3.9 in. The precipitation during the winter, on the other hand, is slight, December, January, and February each averaging from 1 to 1.5 in. of rain and melted snow. The average rainfall for the State during the winter is 3.9 in., during spring 8.3 in., during summer 11.4 in., and during autumn 7.4 in." There are, however, "many 10-day periods, and frequently 20 days or even more, within which only a fraction of an inch of rain falls." The yearly average of sunshine is about 50 per cent.

The relation of the climate to field crops, particularly corn, sugar beets, small grains, grasses and clovers, potatoes, peas, and tobacco, to the dairy industry, and to fruit growing is discussed in some detail.

Climate and meteorology of Australia (*Off. Yearbook Aust.*, 5 (1901-1911), pp. 83-115, pls. 4, figs. 5).—This is a summary in the usual form for the Australian Commonwealth up to the end of 1910.

Evaporation from the Nile at Khartum, R. TÜRSTIG (*Met. Ztschr.*, 29 (1912), No. 10, pp. 454-462).—The data reported are discussed with special reference to the influence of the wind on the rate of evaporation. The observations were made on tanks floating on the surface of the river, held in fixed position above it, and on land. With a wind velocity of 7 km. (about 4.3 miles) per hour, the evaporation per day (24 hours) was 7 mm.; 16 km., 13.3 mm.; and 50 km., 25 mm.

Preliminary report on the analyses of Montana waters, W. M. COBLEIGH, D. B. SWINGLE, and H. E. MORRIS (*Montana Sta. Circ.* 7, pp. 17-34, fig. 1; *Supp. folio*, fig. 1).—This circular is based mainly on analyses of "samples from all the larger cities of the State which are supplied with water from high mountain streams"; well waters from Gallatin, Ravalli, Flathead, Missoula, and Yellowstone counties, and from various points along the Great Northern Railway; and a systematic study of the Yellowstone River. The circular contains special articles on Alkali Water and Human Beings, by C. E. Mollet, and Alkali Water and Domestic Animals, by W. J. Taylor. An automatic still for use on the kitchen range in preparing drinking water from alkali water is described.

Subterranean water, W. M. WATT (*Rhodesia Agr. Jour.*, 10 (1912), No. 1, pp. 37-40, pls. 7).—Conditions determining the occurrence and development of underground water supplies are briefly discussed with special reference to Rhodesia.

Solution of silica in underground waters, F. DIENERT (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 17, p. 797).—There was found to be a direct relation between the solution of lime and silica from Loire sand, and a formula for calculating silica from lime in solution is given as follows: $x-y=Ky$ in which x is the increase in lime, y the increase in silica, and K for the Loire sand used in these experiments is 0.063.

Man and water, H. KRAEMER ET AL. (*Der Mensch und die Erde*. Berlin, Leipzig, Vienna, Stuttgart, 1912, vol. 9. *Der Mensch und das Wasser*, pp. XIV+482, pls. 41, figs. 418).—This is an elaborate discussion, profusely illustrated, of water in mythology and religion, medicine, household, and industry. The

handling of sewage, fresh water fauna and flora, and fish culture are also discussed.

"Grossmann" process for sewage sludge disposal (*Chem. Trade Jour.*, 51 (1912), No. 1378, p. 458; *Mark Lane Express*, 198 (1912), No. 4232, p. 659; *Lancet* (London), 1912, II, No. 19, pp. 1319, 1311).—A process adopted by the Borough of Oldham, England, which produces automatically and within a small area dry manure and completely separates the grease and fatty matter from the sludge is briefly described. It is stated that the manure produced by this process is a brown, odorless, and perfectly sterile powder containing about 40 per cent of humus like matter, "about 2 per cent of ammonia, equal to 8 per cent of sulphate of ammonia with some potash (2.4 per cent) and phosphates (3.5 per cent)." Practical tests of the material on farms are said to have given remarkably good results.

SOILS—FERTILIZERS.

The chemical composition of important American soils, W. O. ROBINSON (*Abstr. in Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, p. 213).—The results obtained by the analysis of 18 soils and subsoils of important types from New York, Pennsylvania, Virginia, North Carolina, South Carolina, and Alabama have led to the following conclusions:

"(1) Silica is uniformly higher in the surface soil than in the subsoil. Iron, aluminum, and titanium are uniformly higher in the subsoil. In all cases but one manganese had concentrated in the surface soil."

"(2) Of the elements not ordinarily determined, lithium was shown to be present in all cases; cesium and rubidium could not be found. The rare earths were present in all soils; chromium, vanadium, and zirconium were present in all cases and in decided amounts; barium and strontium were present in all cases in determinable amounts; molybdenum was proved to be present in one soil only."

"(3) The sulphur content of soils is much lower than expected. The average of 18 determinations gave 0.041 per cent sulphur. More attention should be given to this element in fertilizer practices."

The distribution of silt and clay particles in soils, R. O. E. DAVIS and C. C. FLEWELLER (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 81-83).—The variations in distribution of silt and clay particles in soils of different regions are correlated with climatic conditions, particularly precipitation.

The composition of the loess soils of the transition region, F. J. ALWAY (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, p. 11; *abs. in Chem. Abs.*, 6 (1912), No. 21, p. 3146).—Numerous analyses of loess soil subjected to varying rainfalls are reported and discussed. A very even distribution of mineral constituents was observed to a depth of 6 ft. and with varying rainfall.

Concentration of the soil solution, F. K. CAMERON (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 14-18; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 19, p. 941; *Chem. Abs.*, 6 (1912), No. 21, pp. 3146, 3147).—This is a very brief statement of the fundamental principles of solubility as applied to soil solutions. See also a previous note (*E. S. R.*, 23, p. 122).

The rôle of the lysimeter in soil solution studies, F. K. CAMERON (*Orig. Commun. S. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 49, 50; *abs. in Chem. Abs.*, 6 (1912), No. 21, p. 3147).—In

In this note it is held that lysimeter drainage water is not identical in composition with the soil solution (film water), and that analyses of it can not give direct quantitative information as to the concentration of the soil solution.

The determination of the permeability of soil to water, J. W. LEATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 155-158, pls. 2, fig. 1).—A machine for picking soils for the determination of permeability in alkali soils is described.

The relative effects on plant growth of (a) sodium carbonate and (b) imperviousness in soils, J. W. LEATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 153, 154; *abs.* in *Chem. Abs.*, 6 (1912), No. 21, p. 3145).—Partial neutralization with gypsum of the sodium carbonate of a black alkali soil improved germination and growth, particularly of rice and wheat. The infertility of the soil was apparently due more to the presence of sodium carbonate than to impermeability of the soil.

Biochemical factors in soils, M. X. SULLIVAN (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 365-372).—This is a summary of work by the Bureau of Soils on the oxidizing and catalyzing power of soils and on organic compounds which may be metabolic products of micro-organisms.

Organic soil constituents in their relation to soil fertility, O. SCHREINER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 231-245).—This is a brief summary of work by the Bureau of Soils.

Normal and abnormal constituents of soil organic matter, E. C. LATHROP (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 147-151).—The work of the Bureau of Soils on this subject is briefly summarized.

Effect of histidin and arginin as soil constituents, J. J. SKANNER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 253-264, pl. 1).—This is a brief summary of work by the Bureau of Soils.

Some constituents of humus, E. C. SHOREY (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 247-252).—This is a brief summary of work by the Bureau of Soils, most of which has already been noted from other sources.

The plasticity of clay, J. STEWART (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 265-271).—This article presents evidence to show that the plasticity of clays is due to the presence of humus compounds.

Relation of active phosphoric acid and potash of the soil to pot and field experiments, G. S. FRAPS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 99-102).—The experiments of which this is a brief account have been noted from other sources (*E. S. R.*, 27, p. 520).

Organic phosphorus in the soil, J. STEWART (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 273-300).—The article presents data supplementing Bulletin 145 of the Illinois Station (*E. S. R.*, 23, p. 423) and deals mainly with a comparison of methods.

The conclusion is reached that "the Grandean method is one of the best yet proposed for determining organic phosphorus of the soil. It gives results which are approximately quantitative, and is a useful method when intelligently handled." See also a previous note (*E. S. R.*, 26, p. 814).

A study of soil potassium. B. E. CURRY and T. O. SMITH (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 51-71, fig. 1; abs. in Chem. Abs., 6 (1912), No. 21, p. 3137*).—In a study of certain New Hampshire soils here briefly reported, it was found that these soils are rich in potash and have a high retentive power for potash applied in soluble form. Certain salts, such as sodium chlorid, sodium nitrate, sodium carbonate, and acid phosphate, increase the solubility of the potash. Calcium carbonate, sulphate, and oxid do not affect it. All potassium salts except the phosphate react with the soil and cause new salts to appear in the solution. In many cases the addition of nitrate of soda alone produced maximum yields.

An agrolological study of manganese. P. NORTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 16 (1912), Sect. VII, p. 207; Compt. Rend. Acad. Sci. [Paris], 155 (1912), No. 23, pp. 1167-1169; abs. in Rec. Sci. [Paris], 59 (1912), II, No. 24, p. 764; Chem. Abs., 6 (1912), No. 21, p. 3151*). When manganese soils are added to soils they are made insoluble and the manganese is retained as in the case of the absorption of ammonia, potash, and phosphoric acid. The significance of the soil manganese soluble in weak acids is discussed.

The radio-activity of some typical soils of the United States. R. B. MOORE (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 187-190*).—Determinations of radio-activity in 12 samples of soils are reported and an attempt is made to correlate this property with chemical composition.

Experiments with reinoculation of steamed soils. T. L. LYON and J. A. RIZZELL (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 159-178, pls. 4; abs. in Jour. Soc. Chem. Indus., 31 (1912), No. 19, p. 941; Chem. Abs., 6 (1912), No. 21, p. 3136*).—"Soils, sterilized by means of steam under pressure, were inoculated with fresh soil and with heated soil, and the mixtures and also the uninoculated steamed soil allowed to stand for different periods before analysis.

"In all cases the water-soluble matter decreased on standing. At first the decrease was most rapid in the soil inoculated with fresh soil, but after six months this sample contained most soluble matter. Nitrate-reducing organisms are apparently an important factor in determining the quantities of nitrates formed. Inoculation does not apparently introduce organisms which lessen ammonia formation. Plants grown on these soils made a better growth at first on the soil inoculated with fresh soil, but did not continue at the same rate. The luxuriance of growth is apparently a function of the rate of disappearance of the soluble matter in the soil. The experiments show considerable variation when repeated with different soils.

"The difference in productiveness is not a matter of available nutrients, but depends on the nature of the toxic matter formed in the soils when steamed. The condition of the organic matter before steaming influences the toxicity of the steamed soil. The rapidity of oxidation in the soil does not always indicate the rate at which toxicity disappears, although aeration of the steamed soil and the growth of plants in it both cause a decrease in toxicity."

The chemical analysis of soil. E. O. FERRIS (*New York Cornell Sta. Circ. 12, pp. 1*).—The insufficiency of a chemical analysis unaccompanied by other careful studies for judging the quality of soil, the cost of a chemical analysis, and the unreliability of samples of soil taken by persons untrained in the work, are briefly stated in explanation of the station's policy of not making chemical analyses of miscellaneous samples. Brief suggestions as to methods of soil improvement are also added.

Soil survey of Payne Prairie, Gainesville area, Florida. C. N. MOONEY (U. S. Dept. Agr., Bur. Soils Circ. 72, pp. 5, fig. 1).—This circular is a report on the geology and soil types of the area which until recently was under water.

The region is considered well adapted for summer grazing. The growth dies in the late fall, however, so that cattle can hardly subsist on it in winter. It is believed that thorough draining would fit the land for the production of general farm crops and a variety of trucking crops as well.

Hardin County soils. C. G. HOPKINS ET AL. (*Illinois Sta. Soil Rpt. 3*, pp. 33, pl. 1, figs. 4).—This is the third of a series of Illinois county soil reports and gives the results of a soil survey, including a soil map of Hardin County, which is representative of the unglaciated area in southern Illinois, including Pope, Johnson, Union, Alexander, Pulaski, and Massac counties and also of the hill lands in the lower Illinoian glaciation lying between the Ozark hills and the corn belt. The soil formation and types of the region are described and estimates from chemical analyses of the plant-food content per acre of the soil are given, together with the results of fertilizer tests on soils of the county and on similar types in other counties. An appendix discusses the method of the Illinois state soil survey and crop and fertilizer rotations for permanent soil improvement.

The most extensive soil type, covering most of the ordinary hill land, is the yellow silt loam. The fertilizer tests on this type indicated that the organic matter is very inactive and, consequently, that the liberation of nitrogen is slow. "The other upland soils of the county are not much better supplied with nitrogen, and too great emphasis can not be laid upon the importance of growing legume crops, such as alfalfa, clover, cowpeas, and soy beans, which if infected with the proper nitrogen-fixing bacteria have free access to the inexhaustible supply of nitrogen in the air. On the other hand, there are some difficulties to be met and overcome if the most valuable legume crops are to be grown satisfactorily on these lands. Thus, all of these upland soils are markedly sour, and, consequently, they not only contain no limestone, but require applications of that material to correct the acidity present." The only exception in this regard is a small area of yellow, fine sandy loam which is strongly acid in the subsoil but contains small amounts of lime in the surface soil.

Algae in some Colorado soils. W. W. ROBBINS (*Colorado Sta. Bul. 184*, pp. 24-36, pls. 4).—The author briefly reviews investigations by others on the symbiotic relationship of algae and bacteria (E. S. R., 15, p. 753; 16, p. 851; 17, p. 22), and reports the isolation, with descriptions and illustrations, of different species of algae found in Colorado soils with the ultimate view of studying their function as a source of energy for the nitrogen-fixing bacteria, the activities of which, as shown in the work of Headden and of Sackett (E. S. R., 25, pp. 814, 815), has apparently resulted in the excessive accumulation of nitrates in certain of these soils, notwithstanding their low organic matter content.

Algae were found to occur in many cultivated Colorado soils and soil types, 21 different species being isolated, all of which, with two exceptions, belonged to the blue-green algae (Cyanophyceae). There was a predominance of forms possessing thick, gelatinous sheaths, the most prevalent species being *Phormidium tenue*, *Nostoc* spp., *Anabaena* sp., *Nodularia harveyana*, and *Stigonema* sp.

The ammonifying efficiency of certain Colorado soils. W. G. SACKETT (*Colorado Sta. Bul. 184*, pp. 3-23, figs. 3).—In continuation of the work on the fixation of nitrogen in certain Colorado soils (E. S. R., 25, p. 815), the author reports a study of the ammonifying power of these soils, using cotton-seed meal,

dried blood, alfalfa meal, and flaxseed meal as organic substances. The soils were inoculated with soil infusion, adding to each 100-gm. sample 100 mg. of total nitrogen of each of the nitrogenous materials and 10 cc. of the infusion which was prepared from air-dried soil shaken with 200 cc. of sterile distilled water. A comparison of the results with those of other investigators with soils from other localities is also given.

Summarizing the results of these studies, the author concludes that "the power to transform organic nitrogen into ammonia is a property common to many cultivated Colorado soils.

"Soils in the incipient stage of the niter trouble appear to surpass normal soils in ammonifying efficiency.

"Compared with soils from other localities, niter soils excel in ammonifying efficiency to a very marked degree.

"Nineteen of the 31 soils examined have ammonified cotton-seed meal more readily than the other nitrogenous materials employed; the remaining 12 have broken down the dried blood most easily, 26 have formed ammonia from alfalfa meal more readily than from flaxseed meal, and with 5 the reverse has been true.

"The maximum percentage of ammonia produced in 7 days by any soil from 100 mg. of nitrogen as cotton-seed meal was 51.98 per cent, as dried blood 52.64 per cent, as alfalfa meal 34.85 per cent, as flaxseed meal 12.15 per cent."

Peaty swamp lands; sand and alkali soils. C. G. HOPKINS, J. E. READINGER, and O. S. FISHER (*Illinois Sta. Bul. 157, pp. 94-131, figs. 6*).—The authors report a series of fertilizer experiments on different farms of the peat swamp lands of northern and north-central Illinois, and similar but less extensive tests on the sand ridge soils of the State. Reference is also made to methods of improving the alkali soils in central and northern Illinois.

It is stated that "there are many thousand acres of peaty swamp land in northern Illinois, much of which produces almost no crops because the soil is deficient in the element potassium, although it is rich in all other elements of plant food. . . . The peaty soil varies from almost pure brown peat, containing 50 per cent or more of combustible material, to black muck containing much less organic matter. In some places these soils extend continuously over tracts of considerable size, sometimes over several square miles, to the exclusion of other types of soil; but more commonly the peaty soils occupy irregularly shaped areas scattered about in bodies of land of different kinds. Sandy land is frequently found adjoining or surrounding the tracts of peaty soil, and sand is the most common subsoil found under peaty swamp soils, although a clay subsoil is found in places, and sometimes the peaty soil is underlain at a depth of only a few feet with limestone rock. Occasionally the peaty soil adjoins ordinary Illinois prairie land."

The need of potassium in these soils was indicated in some preliminary field and laboratory tests reported in a previous bulletin (E. S. R., 19, p. 1115). The experiments here reported confirm these results as to the need of potassium. Some kinds of peaty swamp soil may be improved with proper cultivation without the continued use of potassium. In other instances peaty swamp soils, after years of cultivation, resembled the sand ridge soil which is most deficient in the element nitrogen. Applications of nitrogen greatly increased the yield on sand ridge soil. "Certain kinds of farm manure produce fairly good results on some peaty swamp soils, but commonly it is better farm practice to use the manure on other kinds of soil and buy potassium for the peaty swamp soils. . . . While heavy applications of potassium must sometimes be made at first, with proper management only light applications will be required after a few years."

The alkali soils, which are distinct from the peaty swamp soils, occur as spots varying in size from a few square rods to several acres and containing excess of magnesium carbonate. As a rule, the most practical method for improving these soils "is to provide good, deep underdrainage and then place under organic matter, such as straw, farm manure, green oats, weeds, etc." Applications of calcium sulphate have also been found effective, but whether this remedy can be applied economically has not yet been determined.

Remarks on the theory concerning the action of fertilizers. A. RINDELL (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 209-211; abs. in *Chem. Abs.*, 6 (1912), No. 21, p. 3138).—It is maintained that the aim of the use of fertilizers "is to yield a nutrient solution of the concentration demanded at the periods of the most lively assimilation."

Increasing the action of cyanamid on the yield of crops under the influence of iron oxid. A. STUTZER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 391-394; abs. in *Jour. Soc. Chem. Indus.*, 31 (1912), No. 19, p. 941; *Chem. Abs.*, 6 (1912), No. 21, p. 3151).—See a previous note (*E. S. R.*, 26, p. 818).

The fertilizing effect of Palmaer phosphate on peat soils. H. VON FELITZEN (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 85-90, figs. 2).—The experiments here briefly reported have already been noted from another source (*E. S. R.*, 26, p. 428).

The use of ground rocks and ground minerals as fertilizers. W. O. ROBINSON and W. H. FAY (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 215, 216; abs. in *Jour. Soc. Chem. Indus.*, 31 (1912), No. 19, p. 942; *Chem. Abs.*, 6 (1912), No. 21, p. 3149).—"The main points brought out in this paper are: (1) Numerous field and pot experiments hitherto performed have proven that orthoclase and potash mica are not efficient potash fertilizers. (2) At present prices the insoluble potash of orthoclase and muscovite costs more than the soluble potash of the Stassfurt salts. (3) Orthoclase and muscovite are present in American soils in such amounts that any economic application is, figuratively speaking, only a drop in the bucket, and surely can produce no more than proportionate yields."

Field tests with fertilizers. H. A. HUSTON (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 139-144).—An attempt is made to show that the associated materials commonly used in fertilizer experiments may increase the available potash in soils, and so result in misleading conclusions as to the need of the soil for potash fertilizers.

The extraction of potash from silicate rocks. W. H. ROSS (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 217-229).—This has already been noted from another source (*E. S. R.*, 27, p. 628).

The salines of the United States as a source of potassium salts. J. W. TURRENTINE (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 319-332).—Analyses of a large number of the more important salines of the United States do not indicate deposits of potash salts of commercial importance, except possibly in case of the brines from the western desert basins.

Composition of the salines of the United States. J. W. TURRENTINE ET AL. (*Jour. Indus. and Engin. Chem.*, 4 (1912), Nos. 11, pp. 828-833; 12, pp. 885-889).—This is a more detailed account of certain of the investigations briefly reported in the article referred to above.

The effect of sodium manures on the percentage of sugar in certain plants. B. L. HARTWELL and P. H. WISSELS (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 129-135; *abs. in Chem. Abs.*, 6 (1912), No. 21, p. 3139).—Sodium manures decreased the sugar content of mangel-wurzels. They decreased the percentage but increased the total yield of sugar in sugar beets.

The use of aluminum sulphate as a catalytic fertilizer, G. BERTRAND and H. AGULHON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, p. 37).—This is a very brief abstract of a paper presented at the Eighth International Congress of Applied Chemistry. Small applications (2 mg. per kilogram of soil) of aluminum sulphate produced marked increase in growth of barley and radishes.

The use of boron as a catalytic fertilizer, H. AGULHON (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, p. 9; *abs. in Chem. Abs.*, 6 (1912), No. 21, p. 3150).—In this abstract of a paper presented at the Eighth International Congress of Applied Chemistry it is stated that boron in small amounts has a marked effect on various crops, but especially on Grumiferae. Applications of less than 3 kg. per hectare have proved very beneficial to corn. See also a previous note (E. S. R., 24, p. 721).

The use of manganese as a catalytic fertilizer, G. BERTRAND (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, p. 39; *abs. in Chem. Abs.*, 6 (1912), No. 21, p. 3156).—In this brief summary of the main results of the author's work on this subject it is shown that manganese sulphate in amounts not exceeding 30 to 50 kg. per hectare has decided value as a fertilizer. See also a previous note (E. S. R., 27, p. 327).

The use of zinc as a catalytic fertilizer, M. JAVILLIER (*Orig. Commun. 8. Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 145, 146; *abs. in Jour. Soc. Chem. Indus.*, 31 (1912), No. 19, p. 942; *Chem. Abs.*, 6 (1912), No. 21, p. 3159).—Applied at the rate of from 1 to 10 kg. per hectare zinc sulphate was beneficial to corn. The results with other crops were variable.

Commercial fertilizers in 1911-12. G. S. FRAPS (*Texas Sta. Bul.* 149, pp. 29, figs. 2). This bulletin reports analyses and valuations of fertilizers inspected during the period named, and discusses the terms of the state law under which inspection is made. This law, which went into effect September 1, 1911, provides for the investigation of the composition, properties, and agricultural values of fertilizers. In accordance with its provisions not only inspection but a large number of cooperative experiments with fertilizers in different parts of the State are carried on.

AGRICULTURAL BOTANY.

Introduction to agricultural mycology.—I. Soil bacteriology, A. Kossowicz (*Einführung in die Agrikulturmykologie. I. Bodenbakteriologie.* Berlin, 1912, pp. VII+143, figs. 47).—This book, dealing with the bacteria of the soil, is in four parts, treating respectively of the circulation of the elements concerned in plant life processes as affected by the activity of micro-organisms; soil mycology; the mycology of manures; and the influence of manures on the micro-flora of the soil. A bibliography and index are appended.

International catalogue of scientific literature. R—Bacteriology (*Internat. Cat. Sci. Lit.*, 9 (1912), pp. VIII+539).—This is in continuation of the series previously noted (E. S. R., 25, p. 435). The literature indexed is mainly that of 1908 and 1909, titles of articles on bacteriology (including yeasts and molds) and parasitic protozoology to the number of about 5600 being listed.

Less than 100 titles of articles that appeared in American publications are included.

The physiology of denitrifying sulphur bacteria, R. LIESKE (*Ber. Deut. Bot. Gesell.*, 30 (1912), *Gen. Versamml.*, 1, pp. 12-22).—The results of the author's physiological study of a denitrifying sulphur bacterium may be summarized as follows:

A pure culture was obtained on agar of a bacterium about 1μ in length. The organism was checked in development, but not killed, by direct sunlight. The most favorable temperature for its development was about 30° C. No growth occurred under the full atmospheric pressure of oxygen, but development set in at about $\frac{1}{2}$ to $\frac{3}{4}$ of that pressure and a good growth was obtained in the entire absence of oxygen. While heterotrophy was not observed, development was not checked by addition of organic substances.

Various carbonates and bicarbonates, but apparently not free carbon dioxide, can serve as carbon sources during the growth of the culture. Nitrates are reduced to free nitrogen, but nitrites can not be utilized as a source of nitrates. In the chemosynthetic assimilation of carbon dioxide, sulphur and compounds thereof with hydrogen and sodium can be utilized. With an excess of saltpeter these sulphur compounds are gradually but indirectly oxidized to sulphates. It is thought that this bacterium may play an important rôle in the circulation of sulphur under natural conditions.

Hereditary symbiosis of bacteria and tropical plants, F. C. VON FAREN (*Jahrb. Wiss. Bot.*, [Pringsheim], 51 (1912), No. 3, pp. 285-375, figs. 7).—The author studied the phenomena of hereditary symbiosis between bacteria and higher plants independently of Miele, whose work (*E. S. R.*, 26, p. 545) he mentions. Some of his main conclusions may be stated as follows:

It seems that in certain cases there exists a relation of mutual advantage between the higher plant and its hereditary inhabitant. In some instances of hereditary transmission through seed or growing point it is not yet quite clear that the case is not one of simple epiphytism. In some such cases the later invasion by the micro-organism of other parts of the plant was followed by parasitic attack, this being soon followed in turn by apparent symbiosis. These alterations in physiological relations illustrate the difficulty of drawing a sharp line between symbiosis and parasitism.

Outside the bacterial cases, hereditary symbiosis is alleged in regard to various other lower forms. An extensive bibliography is given.

Utilization of nitrogen in air by plants, IV, T. JAMIESON (*Agr. Research Assoc. [Scot.] Rpt.*, 1911, pp. 40, pl. 1).—This is a final report by the author in which he defends his theory regarding the assimilation of nitrogen by plants through special trichomes (*E. S. R.*, 18, p. 125).

The fixing of elementary nitrogen by yeasts, Monilia, and Oidium, A. KOSOWICZ (*Ztschr. Gärungsphysiol.*, 1 (1912), No. 3, pp. 253-255).—Studies are reported of cultures made with a number of species of *Saccharomyces* and with *M. candida* and *O. lactis* to determine their ability to fix atmospheric nitrogen. The results of the investigation show that not only the *Saccharomycetes* but also *Monilia* and *Oidium* are able to assimilate nitrogen from the air.

The assimilation of nucleic nitrogen and phosphorus by lower algae, E. C. TROPOZESCO (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 300-303).—The author, studying *Chlamydomonas reticulata* in media having nitrogen and phosphorus in nucleic or nonnucleic form or lacking one or both of those elements, found that the most flourishing cultures were obtained only in the medium first named and that from these cultures a considerable quantity of mineral phosphorus could be obtained, the amount increasing with age. From these facts the conclusion is drawn that certain lower algae are able to

break up the molecule of nucleic acid, possibly by the agency of a specific ferment; also that nucleic nitrogen and phosphorus are able to serve as nutrient for such algae, and are more favorable to rapid development than the mineral forms of these elements.

Hydrocyanic acid in plants.—I, Its distribution in the Australian flora. J. M. PRING (*Proc. Linn. Soc. N. S. Wales*, 35 (1912), pt. 1, pp. 229-234).—An examination was made of a large number of Australian plants to determine the presence of hydrocyanic acid, the sodium picrate method of Guignard being the test used. Parts of plants were cut up, steeped in water for 24 hours at 40° C., and tested with the addition of emulsin, a solution of amygdalin, or alone.

Of 500 native plants, representing 65 natural orders, 29 species gave positive results in which hydrocyanic acid was liberated by the natural ferment in the plant. Seven exotic species were also recorded as containing cyanogenetic glucosids.

The present paper does not include studies on grasses.

On the presence of free hydrocyanic acid in plants, III, C. RAVENNA and G. BOSINELLI (*R. Acad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5, ser., 21 (1912), II, Vol. 6, pp. 355-358). The authors, in tests made for hydrocyanic acid employing methods previously noted (E. S. R., 27, p. 635), found that cherry laurel leaves killed at 110° gave a negative or a less marked reaction than did those killed at 100°. This fact is thought to support the views that in ordinary testing methods the enzymes have time to form an appreciable quantity of hydrocyanic acid before being destroyed, and that this acid is ordinarily present in these leaves only in glucosid combination. It is thought that the weak or negative reactions observed in case of *Phacelus lunatus* may indicate here a limited breaking up of the glucosid. Negative results obtained in case of almonds are taken to indicate that free hydrocyanic acid is not met with in this plant during its germination.

The presence of hydrocyanic acid in white clover, M. MIRANDE (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 15, pp. 651-653).—The author reports the presence of hydrocyanic acid in white clover (*Trifolium repens*), considerable variation being shown in specimens obtained from different localities.

The formation of anthocyanic pigments in leaves following the annular decortication of the stems, R. COMBES (*Ann. Sci. Nat. Bot.*, 9, ser., 16 (1912), Vol. 13, pp. 1-53). A detailed account is given of investigations the principal results of which have been noted elsewhere (E. S. R., 21, p. 628).

The author finds that often the reddening of leaves and branches follows ringing and that the leaves and branches showing an increased amount of anthocyanin have a greater dry weight and less ash and water than normal ones. The excess seems to be largely made up of carbohydrates. He claims there is a direct connection between the accumulated soluble carbohydrates and the red pigment.

On the mode of formation of pigments in roots of carrots, A. GUILLIERMOND (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 6, pp. 411-414).—The author reports that the elaboration of the pigment in carrot roots has two phases. In the first, mitochondria differentiate into leucoplasts, each of which gives up part of its substance to elaborate a grain of starch. In the second, the leucoplast recovers itself, forming interiorly a pigment in form more or less clearly crystalline, while the starch grain is slowly resorbed, after which the chromoplast disappears almost wholly. The process is said to resemble closely the elaboration of pigments in certain animal cells.

Some responses to color stimuli by certain plants, G. W. HOON (*Ann. Rpt. Columbus Hort. Soc.*, 1910, pp. 157-166, figs. 7).—The author describes experiments to determine the effect the various colors or combinations of colors of

the solar spectrum have on plant life. Colored glass was used in the experiments and as pure colors as possible were obtained. The relation of the color of the glass to temperature, the light intensities, and the spectroscopic readings of the different glasses are given, after which the effects on 14 different species and varieties of plants are described.

It was found that certain colors had marked effect on some plants and scarcely any on others, also that at different times in the growth of a given species one color stimulated the plants to a more rapid growth than it did at other times.

The absorption of ultraviolet rays by chlorophyll, C. DHÉRE and W. DE ROGOWSKI (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 15, pp. 653-656, figs. 2).—Studies were made of the absorption by chlorophylls α and β extracted from *Taxus baccata* and comparisons made with crystallized chlorophyll.

It was found that the pure chlorophyll was remarkably transparent, so far as the ultraviolet rays were concerned. The natural chlorophylls, however, in ether solution had a common absorption band of ultraviolet rays which was about the middle of that portion of the spectrum.

An improved insulator, V. VOÛK (*Ber. Dent. Bot. Gesell.*, 30 (1912), No. 7, pp. 391-394, fig. 1).—A description is given of an improved device for measuring the chemical intensity of light. It is said to be simple and adapted to experimentation in plant physiology and to other purposes.

A schematic representation of the water relations of plants, B. E. LIVINGSTON (*Plant World*, 15 (1912), No. 9, pp. 214-218).—An outline is presented which attempts to show the main factors which appear to determine the moisture conditions in the active parts of the ordinary rooted plant.

Studies on the movement of colloids through living cell membranes, W. RUHLAND (*Jahrb. Wiss. Bot. [Pringsheim]*, 51 (1912), No. 3, pp. 376-431).—The author reports on his investigations made with about 30 basic and 89 acid coloring matters as to their ability to pass through cell membranes of *Allium cepa*, *Spirogyra*, and *Vicia faba*. The solutions are arranged in the order of rapidity of their admission into the cell. The reasons for the different permeabilities observed are discussed and arguments presented for a regulatory control of protoplasm.

The acidity of cell membranes, A. WIELER (*Ber. Dent. Bot. Gesell.*, 30 (1912), No. 7, pp. 394-406).—Following up the conclusions of A. Baumann and E. Gully (*E. S. R.*, 23, p. 715), the author, in order to test the applicability of this view to higher plants, investigated needles of pine; leaves of red beech, American oak, horse chestnut, grape, yellow lupine, and oats; fiber of cotton and flax; and cellulose from conifers.

All of these showed acid reaction regardless of their condition or age when taken. Electrical conductivity, however, was deficient or lacking. Further investigations were thought to show that the apparently acid character was due to the properties of colloid substances in the cell membranes, as claimed by Baumann and others in case of peat moss. The question is raised as to the relation of the composition of these higher plants to that of peat moss on the same soil.

Some chemical relations of plant and soil, W. J. V. OSTERHOUT (*Science*, n. ser., 36 (1912), No. 931, pp. 571-576).—This is an address delivered by the author before Section G of the American Association for the Advancement of Science, in which he briefly outlines some of the relations between plants and soils, discussing the chemical effects of soil substances on the plant under the heads of toxic, stimulatory, nutrient, and protective action. He concludes that the mechanism of antagonism consists primarily in hindering the penetration of toxic substances.

Recent studies on the chemistry of carbon dioxid assimilation, V. GAFFI (*Monatsh. Landw.*, 5 (1912), No. 7, pp. 203-213, figs. 3).—In continuation of a series of discussions (E. S. R., 25, p. 522), a review is given of various studies and views on the rôle played by carbon dioxid and formaldehyde in the growth of plants. It appears that in those plants in which growth is markedly favored by formaldehyde relatively little starch is formed, while reducing sugar is considerably increased. The possible relation of the observed facts to the interests of the plant in the struggle for space, air, and sunshine in early spring is briefly discussed.

The influence of cobalt and vanadium salts on vegetative growth, E. H. DUCLOUX and MARÍA L. COBANERA (*Rev. Mus. La Plata*, 18 (1911-12), pp. 145-163, figs. 15).—The results are given of a number of experiments with salts of cobalt, vanadium, and uranium added to Knop's solution in order to ascertain the stimulating influence of very dilute solutions of these salts on the development of *Pisum sativum*. These investigations are said to be preliminary to a study of the effect of stronger solutions of these salts on the development of plants.

The results as exhibited appear to indicate that whatever stimulating effect appears is slight and is confined almost exclusively to the leaves. The effect on the roots is depressing, as a rule, and is in some cases considerable. In some instances the leaves at the close of the experiment showed the presence of traces of cobalt, vanadium, or uranium as a storage product.

Influence of salts of potassium on the resistance of plants to freezing, C. DUSSEAU (*Bul. Soc. Vand. Sci. Nat.*, 5, ser., 48 (1912), No. 176, pp. 393-395). Attention is called to the difference in resistance to frost injury of 2 varieties of grapes which were grown in a series of fertilizer plots. Each variety was grown with and without potash salts, and those which had received potash were less injured by severe frosts in 1909 and 1912 than the same varieties which had not received this fertilizer. Analyses were made of shoots taken from the different plots, which showed a lower water content and a somewhat higher dry matter and ash content where potash had been given to the plants. The difference in resistance is believed to be due to a difference in concentration of the cell sap within the buds. Similar results were noted on 2 plots of grapevines, one of which had received nitrate of soda and the other was without fertilizer.

The tarring of roads, HÜCKEL (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 7, pp. 603, 606, 626-628).—This author gives a résumé of the present state of knowledge and of opinion in regard to the influence of tarred roads on neighboring vegetation, mentioning the work of various investigators in this connection.

An investigation of the seedling structure in the Leguminosæ, R. H. COMPTON (*Jour. Linn. Soc. [London], Bot.*, 41 (1912), No. 279, pp. 122, pls. 9).—This paper gives a detailed description of the anatomical features exhibited in the transition region of a number of species of Leguminosæ, together with a classified summary of the information at present available on the chief anatomical characters of leguminous seedlings and a general discussion of the relations between seedling anatomy and other vegetative features.

The opening of indehiscent fruits during germination, A. JOXE (*Ann. Sci. Nat. Bot.*, 9, ser., 15 (1912), No. 5-6, pp. 257-375, figs. 52).—In a study made of a large number of indehiscent fruits it was found that their opening during germination was in most cases through regular channels. This splitting of the fruit constitutes a sort of delayed dehiscence. The rupture of the pericarp is said to be due almost entirely to an increase in the volume of the embryo during germination. The anatomical structures related to dehiscence and the position of the lines of dehiscence in reference to their morphological characters are discussed.

The elongation of the hypocotyl. B. D. HALSTED (*New Jersey Stas. Bul.* 35, pp. 32, pls. 12, figs. 6).—This bulletin is introductory to the study of the elongation of the hypocotyl in its relation to successive generations of offspring secured through selection and breeding.

Tests were made of the length of the hypocotyl in beans, radish, cowpeas, turnip, tomatoes, sunflower, etc., and it was found that the average length of the hypocotyl varies greatly in different species and among the varieties of the same species. Hybrids and crosses vary greatly in the lengths of their hypocotyl between those of their parents. It was found that the offspring of different plants of selfed species have hypocotyls that do not show the same averages. The degree of maturity of the seed, mutilation of the embryo, and size of the seed were found to influence the length of the hypocotyl. In addition external factors, such as depth of planting, compactness of soil, distance apart of seedlings, change of position of seedlings, moisture of the soil, moisture of the atmosphere, light, and temperature are influencing factors in determining the development of this part of the plant.

The periodicity of tropical plants. G. KLEBS (*Biol. Centbl.* 32 (1912), no. 5, pp. 257-285; *abs. in Ztschr. Bot.* 4 (1912), No. 9, pp. 643-659).—Pursuant to studies previously noted (*E. S. R.* 27, p. 522), the author gives an account of investigations made by him with a view to ascertaining (1) whether the growth of tropical plants is on the whole periodic and (2) whether the periodicity so far as observed in the Tropics is a constant character or is capable of being modified by varying the conditions. Investigations were made with 24 species of plants on growth, leaf fall, and related phenomena, varying in length for different species from 46 to 83 days.

In a number of tropical species leaf fall apparently occurs nonperiodically, but some cases become periodic when they are old. Some plants were observed to cast their leaves in apparent response to alterations of environment at a time when they would not normally do so at that place. One species, according to variations of nourishment, casts its leaves either all at once or only gradually through a long period. The author considers the question of the plant's relations with the outer world as too fundamental to be considered as settled by any investigations yet made.

Leaf fall and leaf removal in the Tropics. G. VOLKENS (*Laubfall und Auberneuerung in den Tropen. Berlin, 1912, pp. 142; rev. in Ztschr. Bot.* 4 (1912), No. 9, pp. 643-659).—This is a report of an extended study on periodicity in plants made in Java, Ceylon, and elsewhere. Observations were made on a large number of trees representing widely separated regions, and the results are recorded in detail.

At Buitenzorg in case of some deciduous trees, the cycle of change embraced the whole year; in others it was completed in the dry season and again in the wet season of the same year, little difference appearing between the two cycles; in still others little or no regularity or relation to seasons could be affirmed. No general connection was regarded as established between leaf fall and climate at that place. The results at Ceylon and elsewhere were also inconclusive.

Parallel mutations in *Oenothera biennis*. R. R. GATES (*Nature [London]*, 9 (1912), No. 2235, pp. 659, 660).—A brief description is given of a series of forms which have been cultivated from a strain of *O. biennis* obtained from the Madrid Botanical Garden. These forms seem to constitute a parallel series of the well-known mutants from *O. lamarckiana*. Some of the mutants in leaf characters agree with those described under the names *O. laevifolia*, *O. lata*, and possibly one corresponding to *O. gigas*.

The origin of *Oenothera gigas*, T. J. STOMPS (*Ber. Deut. Bot. Gesell.*, 39 (1912), No. 7, pp. 396-416).—The author reports finding what is claimed to be a "half mutant" of *O. lamarckiana*, having 21 chromosomes, the mutant *O. gogae* having 28, double the number ascribed to the parent. To this alleged new form, the author has given the name *O. lamarckiana semigigas*.

FIELD CROPS.

Suggestions to the dry farmer, edited by F. S. COOLEY (*Montana Sta. Circ.* 19, pp. 52, figs. 26).—This circular discusses rainfall, loss of water, management and moisture requirements of crops, and tillage in their relation to dry farming. The data presented are compiled from publications of the station and from other sources. A list of publications on dry farming, or on topics pertaining to the subject, is given.

Forage crops for the cotton region, S. M. TRACY (*U. S. Dept. Agr., Farmers' Bul.* 599, pp. 47).—This bulletin treats of the most important forage crops adapted to the various sections of the cotton region. Six different soil regions are described with particular reference to forage crop culture, and discussions are presented on hay crops and hay-making, pastures, and silage and soiling crops. Twenty-one grasses, 13 leguminous plants, and 6 miscellaneous forage crops are noted individually.

Crop rotation for northern Wisconsin, E. J. DELWICHE (*Wisconsin Sta. Bul.* 222, pp. 3-19, figs. 11).—This bulletin suggests systems of crop rotation which seem best adapted to the existing agricultural conditions in the northern half of Wisconsin. The different systems suggested are outlined graphically and discussed with reference to their value for various types of farming. The rotations included in the discussion are a 3-year rotation for dairy farms, 4-year rotations with clover and timothy, with peas for grain farming, and with peas as a cash crop for dairy farming, a 5-year rotation with alfalfa for dairy farming, a 5-year rotation for heavy soils, clover-seed rotations of different duration, and a rotation for garden and root crops. Notes are given on the place of potatoes in the rotation and on the methods of arranging fields.

County experiment farms in Ohio, C. E. THORNE, C. G. WILLIAMS, and C. McLEUNE (*Ohio Sta. Bul.* 241, pp. 513-549, figs. 3).—This bulletin describes the organization of county experiment farms in Ohio, together with their work in 1911. Such farms are reported in operation in the counties of Paulding, Miami, Clermont, Hamilton, and Hancock. The proposed plan of management for each farm is outlined and some of the results secured in fertilizer and variety tests are recorded. In all instances the work had not been in progress long enough to warrant conclusions. Suggestions as to the requirements of county experiment farms are offered, and the act providing for the establishment of these farms is reproduced.

Agricultural studies in America, A. HÜNNINGSTAD (*Aarsber. Offentl. Foranst. Landbr. Forening*, 1911, IV, pp. 19-114, figs. 9).—This article is a report on a visit to the United States and Canada in 1911 for the purpose of studying methods of experimentation relating to agronomy and allied subjects.

Experiments with wind-breaks, 1909-1911, N. ESBJERG (*Ber. Ribe Amts Landbrugs. Hæft. og Husmands.*, 1911, pp. 3-20).—Experiments similar to previous work (E. S. R., 23, p. 435), were conducted with rye, mangels, clover and grass, and potatoes.

The results showed that shelter had a very beneficial influence on the growth and yield of field crops. It is estimated that the value of the increase in the yields per tøndealand (1.33 acres), due to a systematic planting of hedges in

the fields, amounted to 10 crowns (\$2.70), when the loss of field area and the expense of planting and maintaining the hedges are considered.

Influence of precipitation and temperature on the yields of cereals in the governments of Saratov, Samara, and Tambov. S. KHARIZOMENOV (*Selsk. Khoz. Vestnik Pugo-Vostoka*, 1911, No. 4-6; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 12 (1911), No. 6, pp. 927, 928).—Tables are given presenting data covering a period of 25 years and showing the relation of precipitation and temperature to the yields of cereals, hay, and potatoes.

It is concluded from the data at hand that the yield of these crops increases with the increase in the total precipitation from November to March, inclusive, and that all cereal crops further respond in yield to a high precipitation during the months of November, March, May, and June. The summer cereals apparently fell in yield with the increase of rain during August, September, October, and April. The rains during these months are considered as useful only in promoting the growth of winter cereals and of perennial grasses.

Market hay. H. B. McCURE (*U. S. Dept. Agr., Farmers' Bul.* 508, pp. 38, figs. 3).—This bulletin presents a general review of the hay trade in this country and discusses more in particular the different grades of market hay and methods of baling, shipping, and marketing hay, together with market conditions and requirements. A system of hay grades in use in the principal market centers is outlined, and a table is given setting forth the requirements of the various eastern, western, and southern hay markets, and showing the kinds of hay received, types of bales, methods of inspection and weighing, and the most common faults affecting the selling price.

Further experiments on the economic value of root crops for New York. E. R. MINNS (*New York Cornell Sta. Bul.* 317, pp. 547-566, figs. 8).—Previous work with root crops (*E. S. R.*, 19, pp. 136, 137; 21, p. 426; 22, p. 76) is reviewed, and the results of further experiments in the production of mangels and of silage corn from 1908 to 1911, inclusive, are reported.

The average results for 3 consecutive years show a yield of 17.93 tons per acre and 13.27 per cent of dry matter for half-sugar mangel, and a yield of 17.75 tons per acre and 13.31 per cent of dry matter for the Long Red mangel.

A comparison of corn and mangels as to yield and cost of production was made with Pride of the North corn and with half-sugar mangels. The average results for the 4 years show a yield of 10.80 tons per acre and a cost of 71 cts. per hundred pounds of dry matter for corn, and a yield of 29.14 tons per acre and a cost per hundred pounds of dry matter of \$1.54 for half-sugar mangels. Observations on the relation of weather to the production of dry matter showed that the mangels were less dependent on rainfall and temperature than on soil conditions for the production of dry matter, while the corn crops seemed to conform closely to the variation in temperature and rainfall during the 5 months of the growing season. The average acre production of nutrients, as shown by analyses, was 5,705.6 lbs. of dry matter, 574.1 lbs. of protein, 170.2 lbs. of fat, 3,656.6 lbs. of carbohydrates, 991.5 lbs. of crude fiber, and 313.2 lbs. of ash for the corn, and 5,023.2 lbs. of dry matter, 697.6 lbs. of crude protein, 217 lbs. of fat, 3,701.9 lbs. of carbohydrates, 301.4 lbs. of crude fiber, and 391.6 lbs. of ash for the mangels.

In cooperative experiments similar to those conducted at the station, the cost in labor and fertilizers of a ton of mangels was nearly twice as great as the cost of a ton of corn fodder. The experiments at the station in 1910 showed a cost of production per acre of \$41.90 for corn and of \$76.88 for mangels, and in 1911 a cost of \$45.51 for corn and of \$78.65 for mangels. The results with mangels and corn obtained at the Cornell, Pennsylvania, Michigan, Indiana,

and Minnesota stations are also summarized in tabular form. Brief directions are given for growing mangels, carrots, ruta-bagas, and turnips.

Alfalfa.—The relation of type to hardness, P. K. BLINN (*Colorado Sta. Bul. 181, pp. 3-16, figs. 11*).—Continuing previous work (E. S. R., 26, p. 633), this bulletin gives an account of the alfalfa work at the Colorado Station leading up to and including the discovery of a hardy type "characterized by a more spreading crown, with numerous buds and shoots springing from the crown below the surface of the soil. These underground shoots in some of the best plants of this type have been found several inches below the surface of the soil. The bud area in this type of plant is thus protected by the soil from drying or freezing."

Importance of alfalfa as a Wisconsin forage plant, R. A. MOORE (*Wisconsin Sta. Circ. Inform. 35, pp. 16, figs. 8*).—This circular presents statistical and historical notes on the culture of alfalfa in Wisconsin and discusses in a popular manner the value and culture of the crop in the State. A comparison of grain feeds with alfalfa hay, and a comparison of the yields of green substance, hay, protein, dry matter, and fat of alfalfa, clover, timothy, and brome grass are shown in tables. The cultural directions given have a special bearing on seed-bed preparation, soil inoculation, seeding, and harvesting. Notes are also given on alfalfa as a sowing and a pasture crop.

Southern bur clover, E. F. CARTER (*Alabama Col. Sta. Bul. 165, pp. 163-176, figs. 71*).—This bulletin discusses in a popular manner the culture and uses of bur clover, and in this connection reports as the result of 2 experiments an average yield of 3,495 lbs. of hay per acre from bur clover grown alone, and a yield of 5,520 lbs. of hay from a mixture of bur and crimson clover and oats. The following composition of bur clover hay is recorded: Water 7.59, crude fat 3.22, crude protein 19.50, crude fiber 25.70, and ash 9.80 per cent.

Condition of seed corn in West Virginia and how to test it, I. S. COOK, Jr. (*West Virginia Sta. Circ. 5, pp. 4, fig. 1*).—Directions for testing the germination of seed corn are given.

Fertilizing and irrigating cotton in 1910 at the Turkestan Experiment Station, R. R. SUMNER (*Turkestan, Selsk. Khoz., 1911, Apr.; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 12 (1911), No. 6, p. 862*).—The results of irrigation experiments showed that 4 applications of water increased the yield by about 620 lbs. per acre as compared with 3 applications. With additional applications the increase in yield diminished and with 7 applications the yield began to decrease.

In the fertilizer experiments, barnyard manure gave higher yields than commercial fertilizers, which ranked in decreasing order of increase in yield as follows: Cotton-seed cake, bone meal, blood meal and superphosphate, and nitrate and superphosphate.

Flax growing in Montana, F. S. COOLEY and M. L. WILSON (*Montana Sta. Circ. 15, pp. 95-100, 101-113, figs. 3*).—After presenting certain statistics on flax growing in Montana and the neighboring States, this circular discusses flax culture in a general way with reference to Montana conditions. Notes are given on soils adapted to the culture of the crop, time, rate, and depth of seeding, varieties, seed treatment and diseases, tillage, harvesting and thrashing, the use and value of the straw, cost of production, and the effect of the crop on the land.

Counts were made of an average sample of Brown Russian flaxseed which showed 81,648 seeds in 1 lb.

Commercial varieties of potatoes for Wisconsin, J. G. MILWARD (*Wisconsin Sta. Bul. 225, pp. 3-22, pls. 3, figs. 3*).—This bulletin discusses the value of growing pure varieties in raising or maintaining high market standards, and

gives descriptions with illustrations of a number of standard varieties. The leading standard late varieties recommended for Wisconsin are the Rural New Yorker, Burbank, Carman No. 3, and Peerless, and the leading standard early varieties Early Ohio, Early Rose, and Triumph.

The influence of the soil on the characteristics of potatoes, systems of potato farming, and running out of varieties are discussed and recommendations for improvement are given. Rules for potato exhibitions are laid down and a potato-judging score card is outlined.

Experiments with varieties of rye. E. W. Ljung (*Sveriges Utsädesför.* Tidskr., 22 (1912), Nos. 2, pp. 119-141; 3, pp. 177-200).—A summary is given of experiments with 24 varieties of rye conducted since 1887 at Svalöf and 4 other stations. The Svalöf rye No. 0301, which is a Petkus strain, gave the largest yields of grain and also a large yield of straw. The different varieties are described.

Variety tests with rye, 1905-1910. K. HANSEN and M. L. MORTENSEN (*Tidskr. Landbr. Plantearb.*, 19 (1912), No. 2, pp. 229-304).—These tests, conducted at 4 different experiment stations, were carried on mainly for the purpose of determining the value of Brattingsborg, Petkus, Heinrich, and Probstel rye for Danish agriculture. On loamy soils Petkus ranked first in average yield, followed by Brattingsborg and Heinrich in the order mentioned, while on sandy soils Brattingsborg produced the highest average yield, with Petkus ranking second and Heinrich third. In stiffness of straw Heinrich ranked first in all tests and the straw of the Petkus variety was stiffer than that of the Brattingsborg rye.

Rye culture and rye improvement. E. W. LJUNG (*Sveriges Utsädesför.* Tidskr., 22 (1912), No. 4, pp. 231-241).—This article discusses the general phases of rye culture and rye improvement with particular reference to the work as carried on at Svalöf.

Experiments on the cultivation of sugar beets for the years 1902-1909. edited by S. L. FRANKFURT (*Trudy Sâti Opytn. Polei Vseross. Otschek. Sakh. Zaved., Soobshch.*, 12, 1911; *abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 12 (1911), No. 5, pp. 730-738).—A summary of the results of various fertilizer and culture experiments with sugar beets is presented.

It was found that plowing land to a depth of 10½ in. appeared to be sufficient for sugar beets and that increasing the depth from 8 to 10½ in. yielded but a slight increase. In the fertilizer experiments the relative effect of manure was greater when used at the rate of about 6.7 tons per acre than when 16.75 tons were applied. When mineral fertilizers were applied with the manure the same yields of winter cereals and sugar beets were secured from the light and the heavy applications.

Deterioration in the quality of sugar beets due to nitrates formed in the soil. W. P. HEADEN (*Colorado Sta. Bul.*, 183, pp. 3-184, figs. 7).—The experiments here reported were conducted in continuation of previous investigations on the occurrence of nitrates in Colorado soils in quantities prejudicial to the culture of different crops (*E. S. R.*, 25, p. 814). The object of the work described in the present bulletin was the study of the relation of an undue or untimely supply of nitrates to the quality of the sugar beets grown in some sections of the State and the determination of whether the observed depreciation in the quality of beets is the result of a widespread and excessive supply of nitrates in the soil. Studies are also reported of the influence of alkali, seepage, possible lack or improper ratio of the elements of plant food, leaf spot, and climatic conditions.

Observations made on sugar beets grown 4 years in succession on strongly alkaliized land indicated that the alkali in itself was not detrimental to the

quality of the beets, did not affect their content of dry matter, and slightly increased the quantity of ash without affecting its composition sufficiently to appear definitely of consequence.

It is reported that no serious effects on yield and quality were observed as due to the height of the water plane, which, during the 4 years on portions of the land under experiment, never fell below 4 ft. and was less than 3 ft. below the surface for a good portion of the growing season. These observations were repeated many times with the same results and it is concluded that alkali and seepage are not prevalent enough to regard them as the cause of the depreciation of the general crop of sugar beets.

For the purpose of determining the influence of a lack of plant food or of the relative quantities of plant food elements, experiments with different fertilizers in various combinations were made in 1909 and 1910 on soils sampled to a depth of 3 ft. and showing a great abundance of both phosphoric acid and potash. The application of nitrogen either in the form of sodium nitrate or manure, the dung of cattle fed on alfalfa hay, beet pulp, molasses, and straw to which grain was added during the final stages of feeding, had no definite effect on the yield of sugar. In this whole series the sugar was low and the results were regarded as showing that the poor quality was not due to any lack of plant food.

To establish the effects of leaf spot on yield and sugar content determinations were made in 127 cases, including some lots badly affected with the disease. The results obtained did not show any constant or definite relation between the severity of the attack and the yield and percentage of sugar. Samples from fields severely affected by leaf spot contained from 16 to 17 per cent of sugar.

A series of experiments was begun to ascertain whether beets grown with known excessive quantities of nitrates possess in general the qualities and composition of the beet crops under consideration. In 1910 from 250 to 1,250 lbs. of nitrate of soda per acre in portions of 250 lbs. were applied on 5 plats, the sixth plat in the series receiving no nitrate. These plats were laid out on good, choice ground. The first application was made 2 days before the seed was planted and the succeeding ones at intervals of 4 weeks up to July 27, the date of the last application. Another series of experiments was made with superphosphate, potassium chlorid, and sodium chlorid on a piece of bad ground planted to beets, to observe the effect of these fertilizers on the ripening and the composition of the crop. As standards of comparison for quality and composition samples from Montana, Michigan, and Colorado were selected. The series of samples analyzed included beets from the Arkansas Valley grown on good soils without fertilizers, with various fertilizers, and with various quantities of nitrates alone, on soil in which large quantities of nitrates had developed, and on nitrate land with the application of phosphoric acid, potash, and nitrate of soda, together with beets produced at the station with and without the application of nitrates in 1910 and 1911, respectively. The factors considered in their relation to the quality of the beets were nitric nitrogen, phosphoric acid, injurious ash, injurious nitrogen, ratio of proteid nitrogen to total nitrogen, especially in the juice, and percentage of sugar. The results of this work indicated that beets grown on good Colorado soils may be either good or very poor in quality. The belief is expressed that the beets even when produced under the best conditions contain a rather large amount of ash, specifically of injurious ash, and that the high percentage of nitrogen present in the form of nitrates indicates the cause of the lack in quality when conditions otherwise have been favorable.

The beets grown with fertilizers presented in general a low percentage of sugar, a high percentage of pure ash with a low percentage of phosphoric acid, and a high content of injurious ash and injurious nitrogen, together with a high percentage of nitric nitrogen. Since the use of fertilizers did not ameliorate conditions, the results are regarded as indicating an adequate supply of the different plant food elements in the soil and as suggesting a too liberal or an untimely supply of nitrates.

The crops grown on the choice piece of land with various quantities of nitrates alone showed that while the application of 250 lbs. had been decidedly beneficial, the larger applications had depressed the percentage of sugar from 16.5 per cent to 11 per cent, with an increase of 58 per cent in pure ash and of over 100 per cent in total nitrogen. The nitric nitrogen was increased from 10 to 63 fold and the ratio of the protoid to the total nitrogen was depressed from 31 to 16.5 per cent and the phosphoric acid from 0.038 to 0.024 per cent. The results secured with 250 lbs. of nitrate as compared with Montana beets grown with 200 lbs. per acre showed that the Colorado beets were low in phosphoric acid, had a low ratio of protoid nitrogen to total nitrogen, and contained nitric nitrogen which was absent in the Montana sample. It was also found that the larger quantities of nitrate had increased the chlorine and the sodium oxid. Attention is called to the fact that these points persist through the series of beets grown with the application of fertilizers and that they characterize the poor beets grown on good soil. The real coefficient of purity of the thick juice of the beets grown with the different quantities of nitrate was found to be 87.91 for 250 lbs., 88.3 for 500 lbs., 88.6 for 750 lbs., 86.3 for 1,000 lbs., and 80.43 for 1,250 lbs. of nitrate per acre. It is pointed out that a depression of the real coefficient of purity of the thick juice of 1.93 points, as was the case here, signifies a great decrease in the amount of granulated sugar obtained in the first crystallization.

A study was also made of the beets grown on bad soil, or one containing an average of 1.15 per cent of potash, 0.146 per cent of phosphoric acid, and 0.108 per cent of total nitrogen. The ratio of the nitric to the total nitrogen was 19 per cent in the first or upper 2 in. of the worst, and 3.5 per cent in the second 2 in. of the best portion of the field. In parts per million of the soil the nitric nitrogen ranged from 30 parts in the best to 280 parts in the worst soil samples taken from this area. The analyses of the beets produced on this land gave results in general the same as those obtained in the experiments with nitrate of soda, but they were much more pronounced although not at all in proportion to the amount by which the nitric acid in the soil exceeded the amount applied in the experiments. The beets fertilized with phosphoric acid in these experiments were very low in quality, and this result did not agree with the results secured by the use of superphosphate alone in the fertilizer experiment but rather with the results obtained from its use in conjunction with the nitrate. The real coefficient of purity of the thick juice from the beets grown on the bad land was 69.56 and the nitric nitrogen in this juice ranged from 0.05 to 0.49 per cent.

In another series of experiments conducted for the purpose of studying the effect of an abundant supply of nitrates during August and September, 750 lbs. of nitrate of soda was applied in 4 applications from August 4 to September 28, inclusive. The results in this case showed an increase in the average weight of the beets and tops, a decrease in the percentage of sugar and dry matter, a slight increase in the pure ash, a decrease of about 2 per cent in the phosphoric acid of the pure ash, an increase in the phosphoric acid of the ash of the leaves, an increase of about 100 per cent in the nitric nitrogen, and a depression of the ratio of protoid to total nitrogen.

With the assumption that the effect of leaf spot upon the yield and quality of the beets is due wholly to the destruction of the foliage, an effort was made to imitate this action by defoliating the beets rather late in the season to determine the kind of changes produced in the quality. It was shown that without question the destruction of the leaves even as late as September 1 had an injurious effect, but that the composition of the beets was quite different from that of the poor beets produced in the Arkansas Valley even on good ground, which have the composition and qualities of beets grown with an excessive supply of nitrates.

The conclusion drawn from these various lines of investigation is that the increased production of nitric nitrogen in the irrigated soils over large sections in Colorado is the chief cause in the deterioration of the sugar beets produced.

[Chemical composition of Russian tobaccos], A. KLÛCHAREV (*Selsk. Khoz. i Lësov.*, 243 (1910), July, pp. 573-584; *abs.* in *Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.)*, 12 (1911), No. 5, p. 747).—It is reported from the results of analyses that Crimean tobaccos contained 2.864, Transcaucasian 2.581, Bessarabian 1.958, and Cuban 1.897 per cent of nicotine. The highest nicotine content found in Crimean tobaccos was 3.738 per cent, in Transcaucasian 3.942, in Cuban 3.562, and in Bessarabian 2.935. The dried tobaccos were lower in nicotine than the fermented material, and the lower leaves on the plants proved to be richer in nicotine than the upper ones. Notes on the culture of tobacco in Crimea, Bessarabia, and the Caucasus are also presented.

Distribution of seeds and plants by the Department of Agriculture, B. T. GALLOWAY (*U. S. Dept. Agr., Bur. Plant Indus. Circ.* 199, pp. 23, figs. 12).—This circular reviews the history of the purchase and distribution of seeds and plants by the Government, cites from different acts the passages providing for this work under the Department of Agriculture, describes in detail the congressional seed distribution, and summarizes the Department's work in introducing rare seeds and plants. Some of the more important results of plant introduction are briefly noted.

Report of the seed control station at Lund, 1911, A. VILKE (*Malmö. Läns Hushåll. Sällsk. Årsskrift*, 1912, No. 1, pp. 202-227).—The examination of 3,222 samples of seed is reported and the principal features brought out by the results are discussed.

A warning against fan weed, D. B. SWINGLE and A. ATKINSON (*Montana Sta. Circ.* 12, pp. 44-53, figs. 3).—This circular gives a description of fan weed (*Thlaspi arvense*), points out its injurious character, together with the manner of its introduction into new territory, and suggests methods for its control.

HORTICULTURE.

Fertilizer experiments with muskmelons, J. W. LLOYD (*Illinois Sta. Bul.* 155, pp. 25-64, figs. 6).—The experiments reported were conducted during the seasons 1905 to 1909, inclusive. The chief objects of the work have been to determine the relative efficiency of different amounts of manure and methods of applying manure; the effect of supplementing manure with commercial forms of phosphorus; the effect of using a complete commercial fertilizer in connection with manure; and the effect of substituting commercial fertilizer for manure under conditions typical of 2 of the leading melon-producing regions of Illinois. Twenty different fertilizer treatments were employed.

The results of the experiments as a whole indicate that there may be wide differences in the relative effects of different fertilizers for Gem melons in different seasons. Under the conditions of these experiments, however, manure

ing in the hill proved far superior to broadcast manuring, except where a very large amount of manure can be broadcast. A large amount of manure used in the hills is conducive to the production of a large yield of early melons. Owing to the expense of the manure, however, from 2½ to 3 tons of manure per acre carefully applied to the hills may produce a greater net profit than 4½ to 12 tons per acre applied to the hills or from 16 to 20 tons applied broadcast. Mixing the manure with the soil of the hill has no apparent advantage over applying the same amount of manure without mixing, except possibly where a large amount of manure is applied to the transplanted crop. The addition of raw rock phosphate to a moderate amount of manure in the hills may increase the yield of early melons, the total yield, and the net profits in the field planted crop. Although the use of a complete fertilizer, consisting of steamed bone, dried blood, and potassium sulphate, applied broadcast in addition to manuring in the hill, is conducive to the production of large total yields, the cost of such a fertilizer may render its use inadvisable. The application of the above chemical fertilizer to the hills in place of manure is attended with great danger, especially to the field planted crop, where the yield may be greatly reduced as compared with no fertilizer treatment.

Cover crops for orchards in the Rogue River Valley. P. J. O'GARA (*Off. Path. Rogue River Valley [Oreg.] Bul. 8, 1912, pp. 6, fig. 1*).—According to the author's experience during the past 3 years, a combination of common vetch and winter oats has given the best results as an orchard cover crop in the Rogue River Valley.

The rejuvenation of orchards.—Report of spraying, fertilization, and thinning experiments in southeastern Ohio, 1911, F. H. BAILLOU (*Ohio Sta. Bul. 230, pp. 479-512, figs. 16*).—In continuation of previous demonstration experiments conducted by the station in Washington County (E. S. R., 25, p. 337), the results of spraying, fertilizer, and thinning experiments conducted in 1911 are reported.

The author found that apple trees sprayed with and injured by Bordeaux in 1910 still lacked vigor and failed to produce well, although sprayed with lime-sulphur in 1911. Trees sprayed with lime-sulphur in both years were in splendid vigor in 1911, the foliage and blossoms opened earlier, more uniformly, and in much greater luxuriance and profusion, and a good crop was produced. Trees sprayed with Bordeaux in both years generally produced a lighter crop and fruit of inferior quality as compared with the lime-sulphur sprayed trees. Sooty fungus was thoroughly controlled with the lime-sulphur spray applied late in July, it proving equally as effective as Bordeaux. The application in 1910 of chemical fertilizers with a high nitrogen content assisted the trees materially in overcoming Bordeaux injury. Remarkably increased yields were secured by using nitrogenous chemical fertilizers on the poor soils included in these experiments. Mulching and fertilization with chemicals constituted an admirable method of culture and feeding for orchards situated on steep ground. Thinning apples where the trees were overburdened proved to be a profitable practice.

Relative to the financial importance of spraying, the author points out that previous to 1909, the year in which the demonstration experiments were started, Washington County was buying apples for home use. In 1910 the income from the orchards of the county amounted to \$65,000, and in 1911 to \$200,000.

A spraying program for Montana orchards, R. A. COOLEY and D. B. SWINGLE (*Montana Sta. Circ. 17, pp. 119-153, figs. 12*).—Descriptions are given of some of the more important fungus diseases and insect pests of orchards, together with a spraying calendar for Montana orchards.

Some common spray mixtures. O. S. WATKINS (*Illinois Sta. Circ. 160*, pp. 19, figs. 21).—This circular describes the more important fungicides and insecticides used for spraying apples and gives a spraying schedule for Illinois apple orchards.

Tests of lime-sulphur, Bordeaux mixture, and other sprays. O. S. WATKINS (*Illinois Sta. Circ. 159*, pp. 31, figs. 8).—The tests here reported were conducted by the station in an apple orchard at Neoga, Ill., during the summers of 1910 and 1911 to determine the relative efficiency of lime-sulphur mixtures and Bordeaux mixture, the comparative value of different commercial brands of arsenate of lead, and the value of certain new fungicides and insecticides. The results are tabulated and fully discussed.

A 4:1:50 Bordeaux mixture was more efficient as a fungicide than any of the lime-sulphur sprays. Seif-boiled lime-sulphur was easily washed off and possessed very little fungicidal value in the control of apple scab. Applications of lime-sulphur combined with arsenate of lead made later than 2 or 3 weeks after the fall of the petals were apt to cause serious injury to both foliage and fruit.

Injuries following the use of Bordeaux mixture were lessened by following the Bordeaux as soon as dry with an application of 4:50 milk of lime and by using the drench spray of Bordeaux mixture. Milk of lime appeared to stimulate the foliage and in 1910 shielded the fruit from an April freeze.

The mixture of lime-sulphur and arsenate of lead was more efficient in preventing apple scab than lime-sulphur used alone. Combinations with neutral or ortho arsenate of lead gave better results than arsenates containing higher percentages of arsenic acid. Arsenate of lead when used alone exerted some fungicidal action but caused considerable foliage injury. Lime-sulphur arsenate in combination with copper sulphate gave an efficient spray and caused no injury to either fruit or foliage.

Sulfocide in combination with Paris green caused very serious foliage injury. Curasa proved almost as efficient as Bordeaux in preventing scab infection and caused no russetting of the fruit, but did considerable injury to the foliage. Copper ferrocyanid made from copper sulphate and potassium ferrocyanid controlled scab and insects very efficiently.

The most satisfactory treatment for apples consisted of 4:4:2:50 Bordeaux arsenate applied immediately preceding bloom; 4:50 lime-sulphur solution plus 2 lbs. of arsenate of lead applied immediately after the fall of the petals; and 4:4:2:50 Bordeaux arsenate applied about 10 days after the fall of the petals.

Sulphur-arsenical spray injury and its prevention. J. P. STEWART (*Advance Rpt. from Conn. Pomol. Soc., 21* (1912), pp. 13-21, fig. 1).—A paper on this subject presented at the twenty-first annual meeting of the Connecticut Pomological Society and based on results of tests conducted at the Pennsylvania Station.

Water core of apple. P. J. O'GARA (*Off. Path. Rogue River Valley [Oreg.] Bul. 9*, 1912, pp. 8, fig. 1).—A popular bulletin in which the author discusses the causes of water core and offers suggestions relative to the proper handling of crops where some water core is known to exist.

The possibility and frequency of self-fertilization in cultivated grapes. GARD (*Compt. Rend. Acad. Sci. [Paris]*, 155 (1912), No. 4, pp. 295-297).—Experiments conducted with a number of varieties of cultivated grapes lead the author to conclude that self-fertilization is not only possible but frequent.

The pineapple in Hawaii. J. E. HIGGINS (*Hawaii Sta. Press Bul. 36*, pp. 34, figs. 15).—This comprises a popular summary of the results of experience on the more important aspects of pineapple cultivation in Hawaii. It discusses

soil, location of plantation, propagation, preparation of the soil, planting, tillage, removal of crowns, gathering the crop, ratooning, fertilizers, marketing, crates and packing, shipping, varieties, and diseases and other injuries and their remedies.

A brief discussion of insect pests, by D. T. Fullaway, is also included.

Planting trees and shrubs on the dry farm. O. B. WHITTLE (*Montana Sta. Circ.* 14, pp. 79-94, figs. 2).—A popular circular discussing the selection of plants, selection and preparation of soil, and planting and care of trees and shrubs for the dry-farming region of Montana. Consideration is given to planting for ornamental purposes, for protection, and for a supply of fruit.

The composition and fertilizer requirements of flowering bulbs. M. L. FONDARD (*Orig. Commun. 8, Internat. Cong. Appl. Chem.* [Washington and New York], 15 (1912), Sect. VII, pp. 91-97).—Data are given showing the composition of fresh and dried flowering bulbs of various kinds, together with a table showing the amounts of the principal fertilizer ingredients removed from the soil by each kind of bulb.

FORESTRY.

Euphorbia lorifolia, a possible source of rubber and chicle, W. McGEORGE and W. A. ANDERSON (*Hawaii Sta. Press Bul.* 37, pp. 16).—This bulletin reports a study of the physical and chemical properties of the latex of the koko tree (*Euphorbia lorifolia*), which contains an unusually large quantity of easily obtained latex and occurs in large numbers in the Hawaiian Islands. Some experiments in tapping the wild koko tree are also noted.

A comparative analysis was made of Ceara, balata, and Euphorbia latexes. The Euphorbia yielded 15.8 per cent of caoutchouc as compared with 13.95 per cent for balata, and 75.72 per cent for Ceara. The Euphorbia caoutchouc appears to be of an inferior quality, although it might find use as a low-grade product. The constituents which appear to be of most commercial value are the alcohol and acetone soluble resins, the acetone soluble resin being a product of very fine texture and physical appearance. Euphorbia latex gave a total resin content of 55.95 per cent as compared with a resin content of 47.71 per cent for balata. Since the physical properties of the resins from both trees are similar, it is pointed out that the Euphorbia resin should serve as an excellent substitute for the balata resin in the manufacture of chewing gum.

In observations made on trees growing in the forest, it was concluded that they will grow on very thin soil, at high elevations, with small rainfall, and will live and yield large quantities of latex through long and severe droughts. The trees reproduce freely, and the seedlings are very hardy. The trees can be tapped much like the Castilla tree and about as often. Further observations are to be made relative to the economic importance of the wild tree and also relative to the rate of growth of trees under cultivation and their suitability as plantation trees.

Growth studies in forest trees.—I. *Pinus rigida*. II. P. BROWN (*Bot. Gaz.* 54 (1912), No. 5, pp. 386-403, pls. 2).—This is the first of a series of studies undertaken to clear up disputed points regarding the annual ring formation of trees and to formulate laws of tree growth. The methods of study are described and considerations are given to the microscopical characters of the wood and of the cambium and cortex in winter condition, cambial awakening, place of cambial awakening, growth in lateral branches, rate of procedure, width of the ring, and secondary thickening in the roots.

Fire-killed Douglas fir: A study of its rate of deterioration, usability, and strength. J. B. KNAPP (*U. S. Dept. Agr., Forest Serv. Bul.* 112, pp. 18, pls. 2,

figs. 4).—The study here reported is based both on field observations and on compression, bending, and other tests conducted in cooperation with the University of Washington, at Seattle.

In general the tests indicate that the sound wood from fire-killed Douglas fir of the Pacific Northwest may safely be used for general construction purposes and that its merits are nearly, if not quite, equal to those of material from green, growing trees. After a considerable number of years the fire-killed fir is only slightly weaker than the green timber.

The utilization of wood, J. BERSCH, revised by W. BERSCH (*Die Verwertung des Holzes*. Vienna and Leipzig, 1912, 3. rev. ed., pp. VII+331, figs. 76).—A descriptive account is given of the utilization of wood in the production of acetone, acetic acid, pyroligneous acid, tar oils, etc., oxalic acid, cellulose, tannin and dye extracts, ethereal oils, and resins.

Tests of structural timbers, M. CLINE and A. L. IKEM (*U. S. Dept. Agr., Forest Serv. Bul. 108*, pp. 123, pls. 7, figs. 29).—This bulletin correlates all the tests which have been made by the Forest Service on structural timbers, exclusive of round timbers and other special forms (*E. S. R.*, 19, p. 651). The results of many of these tests have been previously noted separately (*E. S. R.*, 27, p. 846). The text of the bulletin serves as a guide to the study of numerous diagrams and tables, and the appendix contains complete descriptions and test data of the timbers tested. The bulletin also discusses the establishment of standard specifications and grading rules for structural timbers, based on their mechanical properties. A comparison is made of tentative grading rules with export grading rules of the Pacific Coast Lumber Manufacturers' Association and with the standard specifications of the American Railway Engineering and Maintenance of Way Association.

The specific heat of wood, F. DUNLAP (*U. S. Dept. Agr., Forest Serv. Bul. 110*, pp. 28, pl. 1, figs. 5).—Determinations were made of the mean specific heats of 20 species of wood accurately measured over the interval between 106° C. and 0°. The apparatus and methods employed are described and the results are presented in tabular form and fully discussed.

Preliminary results were secured which indicate a great variation of specific heat with temperature. Likewise there appears to be an increase of specific heat due to steaming. The variations in specific heat within a species due to the locality in which it was grown or to the use of heartwood as compared with sapwood were too small to be taken into consideration.

A description of the procedure in generalizing results and the results calculated for each cylinder of wood tested are appended.

Lightning in relation to forest fires, F. G. PLUMMER (*U. S. Dept. Agr., Forest Serv. Bul. 111*, pp. 39, pls. 2, figs. 16).—In this bulletin the author has aimed to bring together all existing data relating to lightning and trees, including also the results of observations made upon the National Forests and of laboratory experiments by the Forest Service, for the purpose of forming some definite conclusions regarding the relative frequency with which trees are struck, the conditions which tend to produce the greatest danger, and the relative susceptibility of different forms and species.

A summary of all the data deemed worth considering leads the author to conclude that trees are the objects most often struck by lightning because of their great number, their greater height, and of their ideal form for conducting an electrical discharge to the earth. The greatest number struck in any locality will be of the dominant species. The likelihood of a tree being struck by lightning is increased if it is taller than surrounding trees, if it is isolated, if it is upon high ground, if it is deeply rooted, and if its conductivity has been in-

creased by becoming thoroughly wet with rain. Most forest fires caused by lightning probably start in the humus at the base of the tree.

Report of the forestry department for the year ended June 30, 1911. R. D. HAY (*Rpt. Forestry Dept. N. S. Wales, 1911, pp. 33, pls. 35, figs. 16*).—In addition to a summarized statement of the operations of the department of forestry for the year ended June 30, 1911, an article on reafforestation and the hardwood supply, by E. H. F. Swain, and a summarized report on the strength, elasticity, and other properties of New South Wales hardwood timbers, by W. H. Warren (*E. S. R., 27, p. 43*), are appended.

DISEASES OF PLANTS.

[Some new Russian fungi], O. TREBOUX (*Hedwigia, 52 (1912), No. 5, pp. 116-118*).—The author gives a list of about 50 fungi from Russia with hosts upon which, it is claimed, they have not been reported heretofore. Of these fungi, 7 are said to be new, as follows: *Ustilago trebouxii*, on *Melica ciliata* and *Triticum cristatum*; *Puccinia festucina*, on *Festuca ovina*; *P. permicta*, on *Diplachne serotina*; *P. proxinella*, on *Pyrethrum millefoliatum*; *Puccinia trebouxii*, on *Melica ciliata*; *Uromyces ceratocarpi*, on *Ceratocarpus arenarius*; and *Uromyces kochia*, on *Kochia prostrata*.

Cultures of heteroecious rusts. W. P. FRASER (*Mycologia, 4 (1912), No. 4, pp. 175-193*).—The author describes the results of culture experiments carried on during the spring and early summer of 1911 with a number of heteroecious rusts. With 12 species he has supplemented previous investigations regarding the host plants, while the life histories of 6 are reported for the first time.

Physiologically distinct forms of *Gloeosporium fructigenum*. O. SCHNEIDER-ORELLI (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, pp. 322-326*).—Continuing briefly a discussion previously noted (*E. S. R., 26, p. 849*), the author here states in substance that the American form of *G. fructigenum* did not develop on pear gelatin at 5° C., while the European form made a fair growth in 35 days; that at 15° the former showed the larger growth in 12 days; that the former apparently reached its maximum a little above 23°, the latter somewhat below that point, while from these maximal points development declined steeply for rising temperatures, ceasing near 32° for the latter; that inoculation experiments on live fruits also showed a higher activity for the American form, especially in the younger fruit, favoring earlier attack and agreeing with the large losses observed in the United States from bitter rot; and that twigs were attacked by the American but not by the European fungus. The suggestion is made that these biologically distinct forms be distinguished as North American and as European *G. fructigenum*, respectively.

The smuts of wheat, oats, barley, and corn. E. C. JOHNSON (*U. S. Dept. Agr., Farmers' Bul. 507, pp. 32, figs. 11*).—Popular directions are given for the recognition of the different smuts of cereals, the characteristics and life habits of the fungi are briefly described, and directions are presented for the treatment of seed for the prevention of stinking smut of wheat, smut of oats, covered smut of barley, and loose smut of wheat and barley, with suggestions for the prevention of the spread of the smut of corn.

The smuts of cereals. G. M. REED (*Ann. Rpt. Missouri Bd. Agr., 44 (1911), pp. 253-265, figs. 5; Missouri Bd. Agr. Mo. Bul., 10 (1912), No. 7, pp. 3-15, figs. 5*).—The author gives descriptions of stinking smut or bunt of wheat, loose smut of oats, and corn smut, together with suggestions for their control by selection and treatment of seed.

Foot disease of wheat and rye. K. STÖRMER and R. KLEINE (*Illus. Landw. Ztg., 32 (1912), No. 62, pp. 564-566*).—This is a brief discussion of the foot dis-

cases of wheat and rye ascribed to *Ophiobolus herpotrichus* and to species of *Leptosphaeria* and some undetermined fungi, respectively. The severe frosts of the previous winter are claimed to favor the appearance and progress of these diseases by weakening the plants.

Careful selection of seed and use of lime, potash, and phosphorus in fertilizers are claimed to lessen injury from these fungi.

Foot disease appearing on surviving wheat weakened by cold. K. STRÖMBER and R. KILLNE (*Illus. Landw. Ztg.*, 32 (1912), No. 38, pp. 369-361).—*Ophiobolus herpotrichus* and *Typhula graminum* were found to be the cause of the continued dying-out observed in a field of wheat which had been greatly thinned by the severe cold of January and February in north Germany. The former fungus, it is said, had before been known to cause stalk disease in that region. It is claimed that the latter, heretofore known only in Sweden and Denmark, has now been shown to be native to the Pomeranian coast. The fungi are thought to winter on the green plants, and possibly on stubble.

Preventive measures suggested are the breeding of varieties of wheat more resistant to cold and avoidance of a succession of crops favorable to the growth of these fungi.

Parasites of alfalfa. G. GANDARA (*Mem. y Rec. Soc. Cient. "Antonio Alzate,"* 29 (1910), No. 7-12, pp. 369-395, figs. 18).—A brief account is given of plant parasites injurious to *Medicago sativa*, including *Cuscuta* sp., *Orobancha rubens*, *Cromyces strictus*, *Peronospora trifoliorum*, *Erysiphe polygoni*, *Pseudopeziza trifolii medicaginis*, *Peronospora helvola medicaginis*, *Colletotrichum trifolii*, *Sclerotinia trifoliorum*, *Rhizoctonia violacea*, *Urophlyctis alfalfæ*, *Asterocystis radialis*, and a *Phospora* thought to be a new species. A brief discussion of each parasite and of remedial measures for its control is given.

Potato leaf roll and our potato crops. O. APPEL and O. SCHLUMBERGER (*Arb. Deut. Landw. Gesell.*, 1911, No. 190, pp. 192+8, pls. 9, figs. 15).—The authors give a discussion of the present state of knowledge of potato leaf roll as to its symptoms, cause, spread, the resistance of potato varieties, and preventive measures; an account, statistical and graphical, of the potato crops of 1908 to 1910; and their conclusions regarding the possibility of an increase of yield, which is stated to have been lower than should be expected for some years past. A general improvement of the conditions of fertility and cultivation, according to more specific suggestions given, is held to be the best means of combating the injury referable to leaf roll disease. An extensive bibliography is appended.

Disease resistance in varieties of potatoes. C. R. ORTON (*Proc. Ind. Acad. Sci.*, 1910, pp. 219-221).—This report is the result of experiments conducted by the author with 76 varieties of potatoes, of which 46 were obtained in Europe, testing their resistance to *Phytophthora infestans*.

On a somewhat arbitrary percentage basis, the findings in duplicate series agreeing closely, however, the varieties tested were arranged in (1) a highly resistant class in which the fungus showed a growth of from 1 to 35 per cent; (2) a middle class exhibiting a growth of from 35 to 65 per cent; and (3) a susceptible class showing a growth of from 65 to 100 per cent. Class 1 consisted wholly of tested disease-resistant potatoes, practically all of European origin. Class 2 was made up largely of tubers of reputed disease resistance which were also largely of European origin. Those of class 3 were practically all of American origin and included many of the most important commercial varieties.

It is concluded that American breeders have developed yield, while European breeders have developed disease-resistant varieties. It is suggested, also, that this may account for the heavy loss by fungus diseases of American potato

crops. The further suggestion is made that by breeding both these desirable features might be developed together. The laboratory method here employed is recommended for testing disease resistant qualities of potatoes.

Potato diseases in Wisconsin and their control, L. R. JONES (*Wisconsin Sta. Circ. Inform. 36, pp. 19*).—Popular descriptions are given of various potato diseases which are known to occur in Wisconsin, together with directions for their control.

Iliou, an endemic cane disease, H. L. LYON (*Hawaiian Sugar Planters' Sta., Path. and Physiol. Bul. 11, pp. 32, pl. 1, figs. 10*).—This is a disease of sugar cane peculiar to the Hawaiian Islands and has been present for many years. The first account of the disease seems to have been that published by Cobb (E. S. R., 18, p. 843).

The disease is characterized by the binding of the leaf bases into a tight, unyielding jacket about the stem. A study of the material has shown that it is due to a fungus, the predominant factor being the imperfect fungus *Melanconium*. Subsequent studies have shown that a perfect form of the fungus is sometimes present, and the name *Gnomonia iliou* n. sp. is given it. The imperfect or *Melanconium* stage of the fungus is said to be of constant occurrence on the diseased shoots, and the spores are thought to be largely responsible for the local spread of the disease.

This trouble seems to be particularly an infection of young canes and flourishes only during cool, damp weather. All of the old, standard varieties seem equally susceptible to attacks of the fungus, but the Demerara seedlings are found resistant to a considerable degree.

A technical description of the fungus is given.

Further notes on timothy rust, F. D. KERN (*Proc. Ind. Acad. Sci., 1909, pp. 417, 418*).—The author reports that this rust has spread, as was predicted in a previous paper (E. S. R., 20, p. 1043), and is now found in localities farther west. Its range extended at the time of this report from Maine to Minnesota and south to West Virginia and Indiana, 9 States in all being invaded by the fungus, which the author now considers to be a variety or subspecies of *Puccinia poeciliformis* or *P. graminis*.

Further notes on timothy rust, A. G. JOHNSON (*Proc. Ind. Acad. Sci., 1910, pp. 203, 204*).—The author gives an account of studies made by him on *Puccinia poeciliformis*, which seems to be spreading, having been reported from a number of new localities.

In most specimens seen, uredospores were much more abundant than teliospores. The vitality of some uredospores tested was found to be greater in those from green blades, but that of spores from blades killed by frost was also high. This is thought to point to the probability that the fungus may be able to pass the winter here in uredo stage, as it is believed to do in Europe. Conditions favoring its development are said to be a heavy, luxuriant growth of the host on ground that tends to hold moisture, also rainy weather with cool nights and moderately warm and still days.

While both air and soil drainage are mentioned as possible means of lessening attack, still more hope is expressed in the development of a strain of timothy having a high resistance to rust.

Studies on the development and spread of decay fungi in storage fruit, O. SCHNEIDER-ORELLI (*Landw. Jahrb. Schweiz, 26 (1912), No. 6, p. 322*).—This is a brief continuation of previous reports on rots of storage fruits (E. S. R., 23, p. 749). The differences observed in the activity of the various fungi are claimed to be referable to the influences of weather and season, stages of ripeness in the fruit, numbers of spores in the air or on fruit surfaces, and the agency of insects as carriers of infection.

Phytophthora omnivora causing die-back of apple trees, A. OSTERWALDER (*Landw. Jahrb. Schweiz*, 26 (1912), No. 6, pp. 321, 322).—A disease of apples was found to be due to attack by *P. omnivora*, supposed to have been favored by the wet season and the consequent splashing of the trees with infectious material from heavily infected weeds and strawberries in the vicinity.

The olive knot, W. T. HORNE (*Mo. Bul. Com. Hort. Cal.*, 1 (1912), No. 9, pp. 597-600, figs. 5).—This is an account of experiments made with olive knot in California, as the result of which it is stated that continual wetting of the knots by rain favors the exudation of an opalescent slime which contains in large numbers the organism (*Bacterium savastanoi*) which is said to cause the knots. Dispersion of this organism is thought to occur by washing, spattering, and other means. Infection is thought to take place for the most part through natural fissures on the uninjured bark, where the bacteria are kept moist while penetrating the tissues into the living bark.

Remedial measures have not yet been worked out in an entirely satisfactory way, but cutting off knots and disinfecting the wounds during the summer, spraying or painting with fungicides during the autumn, and cutting away infected smaller branches are said to be beneficial measures.

Court noué on vines near Montpellier, P. JACCARD and J. BURNAT (*Rev. Vit.*, 57 (1912), No. 961, pp. 665-668; *abs. in Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Int. and Plant Diseases*, 3 (1912), No. 7, pp. 1672, 1673).—Continuing previous studies by Jaccard (*E. S. R.*, 24, p. 350), the authors state that in a vineyard on good soil near Montpellier the vines were affected with court noué which slowly spread, and that when these vines were taken up and a new variety planted the young vines also showed the disease. No parasite or traumatic or frost injury could be connected with the disease, but the diseased shoots were less lignified, while the leaves showed an alteration of chlorophyll (the veins reddening first) and appeared to form prematurely an abscission layer, so as to be easily pulled off. Grafting is thought to have played a negligible part, if any at all, in causing this disease.

The conclusion reached is that the disease is probably one of physiological origin, related in some way to nutrition. The suggestions are made that high productivity may be a factor, causing exhaustion of both soil and vine, and that manuring in holes, by encouraging the roots to grow continually in the same soil, may cause exhaustion or fatigue of these portions. It is suggested that an even distribution of the manures employed and severe pruning to restrain productivity may lessen the injury due to court noué.

Infection of grapevines by Plasmopara (Peronospora) viticola, H. MÜLLER-THURGAU (*Landw. Jahrb. Schweiz*, 26 (1912), No. 6, pp. 318, 319).—This is a brief account of a continuation of previous investigations (*E. S. R.*, 26, p. 851).

The results, it is said, were confirmatory of conclusions previously announced. No infections occurred on the unwounded upper surface of the leaf, while the great majority of the inoculations developed infection on the lower. Fully grown leaves developed infection somewhat sparingly, and on these the fungus growth remained small, developing few conidiophores and soon dying out. On young and still tender leaves the infection was more common and the formation of conidia was abundant. On still younger leaves, less infection occurred, and on several of the youngest leaves none could be found, even on the lower surfaces. A notable feature was that a large number of oöspores developed within two weeks of the infection. The noninfection of the upper leaf surface is accounted for by the almost total absence of stomata on that side, and these facts are held to be of high significance in relation to a new plan for a more economical and effective protection by application of sprays to the lower leaf surface only.

Wintering over of *Plasmopara* (*Peronospora*) *viticola*. A. OSTERWALDER (*Landw. Jahrb. Schweiz*, 26 (1912), No. 6, pp. 319, 320).—The author reports that a search of mildewed leaves on grapevines in October, 1909, showed the presence in large numbers of oöspores of *Peronospora* on each of several varieties of cultivated grapes, especially on the variety Aramon Tupestris. It is claimed that this indicates where and in what form this fungus passes the winter, and that a starting point has been obtained for a plan of attack on this disease in early spring.

Further studies on red scald of grapes. II. MÜLLER-THURNAU (*Landw. Jahrb. Schweiz*, 26 (1912), No. 6, pp. 313-318).—In continuance of work reported on from 1902 to 1903 (E. S. R., 14, p. 1089; 15, p. 486), the author gives a brief account of his investigations made on *Pseudopeziza tracheiphila*, said to cause red burn or red scald of grapevines.

It is claimed to have been shown that the fungus spreads from the fallen leaves, forming conidia in late summer and autumn, and that in the following spring ascospores are liberated from the apothecia which form in late fall and winter. Inoculation experiments resulted in infection and production of typical symptoms of the disease in fewer than half the experiments, the causes of failure not having been determined. Infection occurred on the upper as well as the lower side of the leaves. The attacks of this fungus are thought to be favored by drought or by restriction of the root system of the vines.

It is said that proper spraying with Bordeaux mixture gives sufficient protection, but that circumstances render it difficult to ascertain the most suitable time for this application.

Phytophthora on strawberries. A. OSTERWALDER (*Landw. Jahrb. Schweiz*, 26 (1912), No. 6, pp. 320, 321).—The author reports the occurrence on strawberries of *Phytophthora omnicolora*, describing the effects of its presence on the fruit. It is said that in rainy weather the fungus develops in or on the fruit spores, swarmspores, and conidiospores, increasing the difficulty of its control.

The large leaf spot of chestnut and oak. A. II. GRAVES (*Mycologia*, 3 (1912), No. 3, pp. 170-174, pl. 1, fig. 1, abs. in *Phytopathology*, 2 (1912), No. 2, p. 92).—The author reports finding a leaf spot disease occurring abundantly on the leaves of the chestnut and oak in Virginia, North Carolina, and Georgia, which he has called the large leaf spot to distinguish it from a smaller leaf spot common to the chestnut leaf and due to the fungus *Septoria ochroleuca*.

On leaves of the chestnut the large leaf spot makes its appearance about August 1 as small circular spots, which increase by concentric bands until they attain a diameter of 5 or 6 cm. By the coalescence of several spots often half or more of the leaf may be killed. The under side of the leaf exhibits a whitish moldy character on the margin of the diseased area, due to the projecting growth of the mycelium. The disease on the leaves of the red oak (*Quercus rubra*) exhibits similar symptoms.

The fungus causing the disease has been identified as *Monochaetia desmazierii*. Successful infection experiments have been carried on with it, and from the results obtained it appears that insect bites or mechanical injuries aid the fungus materially in gaining entrance to the leaf, although it is not definitely known that it can not enter the leaf without this assistance.

In some cases trees were found which had lost at least 40 per cent of their green assimilating tissue as a result of attacks of the fungus. Usually the damage is much less, but it is believed to be sufficient to cause considerable diminution in the annual wood increment.

So far as the disease occurs in the forest, very little at present can be done to check it. Upon individual trees it is thought probable that spraying would prevent the recurrence of the fungus.

Steccherinum septentrionale in Indiana, H. J. BANKER (*Proc. Ind. Acad. Sci.*, 1910, pp. 213-218, fig. 1).—The author gives some observations made on this fungus, also known as *Hydnum septentrionale*, and somewhat rarely met in Indiana. It seems to prefer beech, but is also thought to be found growing on maple and perhaps hickory in some sections, possibly also on linden and elm in Europe. The mycelium ramifies in the heartwood of large live trees, appearing at openings to form its immense sporophores. The fungus seems rather saprophytic than parasitic in habit and has not been shown to kill or seriously injure its host.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

National reservations for the protection of wild life, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ.* 87, pp. 32, figs. 5).—This circular brings together for convenient reference the more important facts regarding the various reservations, of which there are 95 scattered in 26 States and Territories and the District of Columbia. A list of some of the more important publications with special reference to the fauna or to the administration of the preserves is included.

Directory of officials and organizations concerned with the protection of birds and game, 1912, T. S. PALMER (*U. S. Dept. Agr., Bur. Biol. Survey Circ.* 88, pp. 16).—This thirteenth annual directory of officials and organizations concerned with the protection of birds and game in the United States and Canada follows the arrangement of previous years (*E. S. R.*, 25, p. 757).

Regulations for the protection of game in Alaska, 1912 (*U. S. Dept. Agr., Bur. Biol. Survey Circ.* 89, pp. 2).—The regulations here promulgated relate to the open season for deer, limit in number killed, the sale of deer carcasses, the killing of deer on certain islands, the killing of caribou on the Kenai Peninsula, and the season for killing walrus.

Food of our more important flycatchers, F. E. L. BEAL (*U. S. Dept. Agr., Bur. Biol. Survey Bul.* 44, pp. 67, pls. 5).—This account is based upon examinations of 3,398 stomachs, belonging to 17 species, most of which were obtained in the United States and the remainder in British America.

The animal food in the whole number of stomachs averaged 94.99 per cent and the vegetable 5.01 per cent. "Hymenoptera (wasps, bees, and ants) amount to nearly 35 per cent of the average diet of the 17 species. . . . Of 13 of these species Hymenoptera are the largest element in the diet. Of 1 species Orthoptera (grasshoppers and crickets) are the leading food; in another Lepidoptera (moths and caterpillars) are the favorites; and in 2 others Diptera (flies) stand at the head. Hemiptera (bugs) are eaten quite extensively by some, but naturally the ones taken are the larger flying species. Plant lice and scales have not yet been found in the stomach of any flycatcher, though one bird was shot on a plant covered with lice, with which its bill was filled.

"The flycatchers for the most part inhabit the open country and prefer to live about gardens, orchards, and sparsely timbered hillsides. Several species are not averse to human neighbors and make their nests in the eaves of buildings, while a number of others build in covered sites, such as hollow trees, under bridges, or under the overhanging bank of a stream."

The species considered are the scissor-tailed flycatcher (*Muscivora forficata*), kingbird (*Tyrannus tyrannus*), Arkansas kingbird (*T. verticalis*), Cassin's

kingbird (*T. vociferans*), crested flycatcher (*Myiarchus cinerascens*), ash-throated flycatcher (*M. cinerascens*), phoebe (*Sayornis phoebe*), Say's phoebe (*S. sayana*), black phoebe (*S. nigricans*), olive-sided flycatcher (*Nuttallornis borealis*), wood pewee (*Myiochanes virens*), western wood pewee (*M. richardsoni*), yellow-bellied flycatcher (*Empidonax flaviventris*), western yellow-bellied flycatcher (*E. difficilis*), Acadian flycatcher (*E. virens*), Traill's and abler flycatchers (*E. trailli trailli* and *E. trailli alnorum*), and least flycatcher (*E. minimus*).

While some of the insects taken by flycatchers for food are parasitic and predaceous Hymenoptera, which are to be classed among useful insects, "Impartial consideration of the diet of these flycatchers throughout the year, however, leads to the conclusion that on the whole the birds do considerably more good than harm and hence should be protected as allies of the farmer and the horticulturist."

Insects injurious to stored grains and their ground products, A. A. GIBBALT (*Illinois Sta. Bul.* 156, pp. 67-92, figs. 14).—This is a popular account in which 9 of the more important granary moths, beetles, and weevils are considered. Preventive and remedial measures are discussed and a key given for the identification of granary insects.

Some shade tree pests in eastern Massachusetts, A. F. BURGESS (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 172-189, pls. 2).—A general discussion of shade tree conditions in eastern Massachusetts. The pests referred to are the European bark beetle (*Eccectopogaster multistriata*), leopard moth, white-marked tussock moth, elm-leaf beetle, and gipsy and brown-tail moths.

Notes on three shade tree pests, G. W. HERRICK (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 169-172).—These notes relate to the elm-leaf beetle (*Galerucella latocla*), elm sawfly leaf-miner (*Kaliosysphinga ulmi*), and larch case bearer, and their control.

Damage to the wood of fire-killed Douglas fir, and methods of preventing losses, in western Washington and Oregon, A. D. HOPKINS (*U. S. Dept. Agr., Bur. Ent. Circ.* 159, pp. 64).—This circular is to supplement Forest Service Bulletin 112 (see p. 49) and Bureau of Entomology Circular 127, previously noted (*E. S. R.*, 24, p. 256). Whenever the dying and dead timber is available for utilization within 1 to 6 or more years, much, and sometimes practically all of the loss due to wood-boring insects is said to be preventable.

Unconsidered factors in disease transmission by blood-sucking insects, F. KNAB (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 196-209).—The author points out that, in order to be a potential transmitter of human blood parasites, an insect must be closely associated with man and normally have opportunity to suck his blood repeatedly.

Results of experiments to determine the effect of Roentgen rays upon insects, W. D. HUNTER (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 188-193).—After first reviewing the literature relating to this subject, the author briefly reports experiments carried on with the rice weevil, 3 species of ticks (*Margaropus annulatus*, *Argas miniatus*, and *Dermacentor venustus*), 2 isopods (*Armadillidium vulgare* and *Porcellio laevis*), *Culex pipiens*, the sugar-cane mealy bug, and the sugar-cane borer. The work fails to indicate that the rays had any effect whatever upon the fertility or development of the various stages of these species.

Papers on deciduous fruit insects and insecticides.—The one-spray method in the control of the codling moth and the plum curculio, A. L. QUAINANCE and E. W. SCOTT (*U. S. Dept. Agr., Bur. Ent. Bul.* 115, pt. 2, pp. 87-112, pl. 1, figs. 4).—This is a second report on the one-spray method in the control of the

codling moth in comparison with the usual demonstration treatment of from 3 to 5 applications, according to locality. The experiments here reported are in continuation of those detailed in the publication previously noted (E. S. R., 24, p. 299), and were carried on in connection with other experimental work at several field stations, namely, in Virginia, Michigan, Delaware, and Kansas. In cooperation with the Bureau of Plant Industry, attention having also been given to the control of certain apple diseases.

The results corroborate those previously reported as to the efficiency of the one-spray method in controlling the codling moth and plum curculio. "Bringing together the results of all of the tests which represent several seasons and varied conditions, it is found that the average of the percentages of sound fruit from a single spraying is 90.64 as compared with 96.19, the average of the percentages of sound fruit on the demonstration plots receiving from 3 to 5 applications. The unsprayed plots show an average of 57.79 per cent of fruit free from codling moth injury. The variation in percentage of sound fruit is considerably greater with plots receiving the single application than where the demonstration treatment was given, indicating, perhaps, a less degree of insurance from injury, especially under unusual seasonal conditions, as in case of injury of fruit by hail, etc., as occurred in Virginia during 1909. For the entire period the range in percentage of sound fruit on the demonstration plot is from 92.91 (Michigan, 1911) to 99.42 (Virginia, 1910), and on the one-spray the range is from 81.07 per cent (Virginia, 1909) to 99.01 per cent (Virginia, 1910)."

These data, while obtained under rather variable conditions of experiment, establish beyond doubt that a single thorough application of an arsenate of lead spray at once after the falling of the petals will protect from codling moth injury a large percentage of the crop, though not quite so high a percentage as by several applications designed to protect the fruit during the entire season.

"While the information as regards the plum curculio is not so full as desirable, it also appears that this insect is controlled by the single thorough treatment practically as well as by the usual 3 or 4 applications. Thus the 6 orchards where data were obtained by the Bureau on the curculio give an average percentage (average of percentages) of fruit free from injury on the one-spray plot of 82.62 as compared with 82.40 per cent of sound fruit on plots receiving the demonstration treatment. The percentage of sound fruit on the unsprayed trees was 55.50. Results obtained by Rumsey [E. S. R., 23, p. 259] fully substantiate the foregoing. . . . In the case of the curculio the degree of protection afforded by spraying varies much more widely than for the codling moth, depending upon the abundance of the insects and the quantity of fruit present on the trees. . . .

"It would therefore appear from the foregoing that for the control of the codling moth and plum curculio under eastern conditions, a single thorough spraying is about as efficient as a schedule of treatment requiring 3 or more applications; were these the only troubles to be considered, the orchardist would hardly be justified in making additional applications."

Attention is called to the fact that the value of a single spraying depends entirely upon the extent to which the calyx cups of the fruit are filled with the poison. It is stated that the necessity of filling the inner calyx cup with poison, as insisted upon by western entomologists, and the employment of a nozzle throwing a coarse spray, as the Bordeaux, has not been, on the whole, confirmed under eastern conditions. It appears that as good results follow the use of nozzles throwing a fine spray as where coarse nozzles are used.

"The practical utility of the one-spray method under eastern conditions is greatly lessened on account of the necessity in most regions of giving orchards additional applications of fungicides for the prevention of such diseases as apple scab, bitter rot, apple blotch, sooty blotch, etc. In regions where bitter rot and apple blotch are not troublesome, and in the case of varieties little susceptible to apple scab, the single application would be most likely to have value, and orchardists thus situated should determine the applicability of the method under their respective conditions. Where additional sprayings are necessary for fungus diseases, an arsenical should be added, as the additional cost is slight."

The importance of great thoroughness in spraying after the falling of the petals was developed during the studies, and is emphasized by the authors.

The efficiency of the driving spray. E. D. BALL (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 147-153).—Following a brief consideration of methods recommended for codling moth study, the author presents a tabular summary of the results of driving spray tests in 1911 in which arsenate of lead at the rate of 5 lbs. to 100 gal. of water was used.

Even under extremely wormy conditions the 50 per cent of the worms that went into the calyx ends were practically all destroyed by one application, giving an efficiency of 99 or 100 per cent in every case. Even in the second brood with the number of worms increased many times, the lowest calyx efficiency was 95 per cent and the average almost 98 per cent, while the total for the year was 99 per cent.

In experiments in which 2½ lbs. of lead arsenate was compared with 5 lbs. to 100 gal. of water, the difference in the number of worms which survived was small in the first brood but became much larger in the second brood where it was from 10 to 20 per cent. This is said to confirm previous experiments and to show that under wormy conditions 4 lbs. of lead arsenate to 100 gal. of water is the least that should be used.

Ortho-arsenite of zinc as an insecticide. R. A. COOLEY (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 142-146, pl. 1).—Used upon potatoes in combating the Colorado potato beetle, ortho-arsenite of zinc at the rate of 1 lb. to 50 gal. of water was as effective as Paris green, 1 lb. to 50 gal. of water, both being entirely satisfactory. Applied at the rate of 1 lb. to 75 gal. of water, however, it was not entirely effective. When used on cabbage, in combating the larvae of the European cabbage butterfly and the diamond back moth, at a strength of 3 lbs. to 100 gal. of water, it was as effective as arsenate of lead at the rate of 6 lbs. to 100 gal. of water, and more satisfactory than Paris green, which, used at the rate of 1 lb. to 100 gal. of water, injured the cabbage plants through settling to the bottom of the knapsack sprayer. Tests made at the Montana Station are said to have shown neutral arsenite of zinc to be less injurious to the bark of the apple tree than any other arsenical compound used.

Grasshopper work in Minnesota during the season of 1911. F. L. WASHBURN (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 111-121).—This is a summarized account of the work carried on in the western third and half of the southern part of Minnesota, where grasshoppers of various species have been increasing to such an extent that serious losses have been occasioned. All grains suffered, as well as timothy, corn, young trees in the nursery row, garden products, and particularly flax.

About 79 orthopterous species were collected and named. Of these species, only a comparative few were strikingly injurious, namely, *Melanoplus bivittatus*, *M. atlantis*, *M. femur-rubrum*, and *M. differentialis*, to which *Stenobothrus curtippennis* may possibly be added and, to a lesser extent, *Camnula pellucida*.

M. birtatus, of secondary importance in 1909, was the most abundant of the injurious forms.

A mixture consisting of arsenite of soda 3 lbs., molasses 1½ gal., and water 180 gal., applied at the rate of 50 gal. per acre, was fatal to the grasshoppers and did not injure crops.

Modern warfare against grasshoppers, F. L. WASHBURN (*Pop. Sci. Mo.*, 81 (1912), No. 5, pp. 465-474, figs. 12).—This is a discussion of the methods now in use in combating grasshoppers in Minnesota.

Grasshopper conditions in Colorado, C. P. GILLETTE (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 121-123).—This paper sets forth the grasshopper conditions in Colorado.

The susceptibility of adults and eggs of pear psylla to spraying mixtures, P. J. PARROTT and H. E. HODGKISS (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 193, 194).—It is stated that during 1911-12 growers freed their orchards of the pear psylla by spraying with miscible oils, homemade emulsions, or commercial nicotine preparations. See also a previous note (*E. S. R.*, 25, p. 658).

Aphid pests of Maine.—Food plants of the aphids.—Psyllid notes, EDITH M. PATCH (*Maine Sta. Bul.* 202, pp. 159-234, pls. 10, figs. 26).—The first paper here presented (pp. 159-178) consists of notes on 17 aphid pests occurring in Maine on conifers and certain other plants and includes descriptions of 2 species new to science, namely, *Lachnus curripes*, which is not uncommon on the balsam fir (*Abies balsamea*) and *Aphis abbreviata*, which occurs on the leaves of water-plantain (*Alisma plantago-aquatica*), both at Orono. A new genus, *Neoprociphilus*, is erected for *Pemphigus attenuatus* of Osborn and Sirline.

The second paper (pp. 179-214) is Part 1 of a Food Plant Catalogue of the Aphidæ of the World.

The third paper (pp. 215-234) consists of Notes on the Psyllidæ, of which 16 species are described as new to science.

Utilization of fungus parasites of Coccidæ and Aleurodidæ in Florida, J. R. WATSON (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 206-204).—This is a brief statement of the present status of the subject. See also a bulletin by Morrill and Buck (*E. S. R.*, 27, p. 800).

The cotton worm or caterpillar (*Alabama argillacea*), W. E. HINDS (*Alabama Col. Sta. Bul.* 164, pp. 139-160, figs. 13).—This is a general account of the cotton leaf worm, including its life history and habits and remedial measures. In the outbreak of 1911, 66 of the 68 counties of Alabama had been practically stripped by the worms before the end of the season. Careful field studies combined with reports received from all counties indicated that Alabama alone suffered a reduction of between 120,000 and 175,000 bales with an estimated damage of more than \$7,000,000.

The outbreak of *Alabama argillacea* in 1911, W. D. HUNTER (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 123-131).—These data are included in a paper previously noted (*E. S. R.*, 27, p. 556).

Papers on deciduous fruit insects and insecticides.—Life history studies on the codling moth in Michigan, A. G. HAMMAR (*U. S. Dept. Agr., Bur. Ent. Bul.* 115, pt. 1, pp. 86, pls. 3, figs. 22).—This paper brings together the results of a detailed study of the life history of the codling moth made during 1909, 1910, and 1911 at a temporary field station at Douglas, Mich.

It was found that in Michigan one full brood and a partial second are produced. "In the field the earliest moths of the spring brood commence to appear from 5 to 10 days after the apple blossoms drop, and the earliest larvae of the first brood hatch from 3 to 4 weeks after the petals drop. The earliest larvae of the second brood hatch from 10 to 11 weeks after the petals drop. During

exceptionally warm and forward seasons the second-brood larvæ may appear considerably earlier, and were, in 1911, observed 8 weeks after the petals dropped. This record, however, should be considered very exceptional. . . .

"Egg deposition commenced in the cages from 3 to 9 days after the emergence of the moths, and most of the eggs were laid within 5 days after egg deposition commenced. In one instance eggs were laid 23 days after the emergence of the moth, but as a rule the great majority of the eggs were laid within 8 days of the emergence. The number of eggs per female varied considerably in the cages—on an average, 57 eggs per female were obtained. A single female deposited 161 eggs. Under normal conditions in the field the average number of eggs is unquestionably higher and probably approaches 80 to 90 eggs per female. The average length of life of the moths was found to be 9 days for the males and 11 days for the females. Instances occurred when one male lived 32 days and a female lived 37 days. The length of the incubation period of the eggs varied greatly under different temperature conditions. For the first brood the average length was 7 days and for the second brood 8 days. The range of variation extended from 4 to 16 days. . . .

"The length of the feeding period of the larvæ of the first brood varied from 17 to 45 days and averaged 25 days for the 'transforming' larvæ and 28 days for the 'wintering' larvæ. Still larger variation in the length of feeding was observed in the second brood, ranging from 20 to 84 days and averaging 36 days. On an average the larvæ spun their cocoons and pupated in 7 days. This period varied, however, from 3 to 18 days.

"The pupal stage varied greatly under different temperature conditions. . . . The average length of the pupal stage was 18 days and ranged from 1 week to 2 months. The length of the first generation, from the time of the appearance of the eggs to the time of emergence of the moths that resulted from the same, averaged 51 days in 1910. During 1911 the duration of the life cycle varied from 29 to 87 days and averaged 50 days.

"The relative abundance of first-brood and second-brood larvæ varied from year to year. In 1909 the second-brood larvæ . . . constituted 57 per cent of the larvæ for the season. During 1910, owing to the wide-felt scarcity of apples, the second brood only reached one-third the number of the first brood. During 1911 the second brood almost approached the first brood in abundance. Of the first-brood larvæ only a portion transformed the same season, while the other portion passed the winter in the larval stage. During the 3 years of observation the ratio between transforming and wintering larvæ of the first brood varied from 30:70 per cent to 51:49 per cent, respectively, and averaged 36 per cent transforming larvæ and 64 per cent wintering larvæ. The larvæ of either brood shed the skin (molted) 5 times, and had thus 6 instars. A limited number of larvæ molted only 4 times.

"A hymenopterous fly, *Ascogaster carpocapsæ*, was found to parasitize from 6 to 7 per cent of the larvæ of the codling moth. Hibernating codling-moth larvæ succumb extensively to the cold during the winter."

The results of this investigation in Michigan showed that poison-spray applications are most effective when applied at the following periods: First, shortly after the petals drop, to fill the open calyx cup and thus destroy the larvæ which hatch later; second, from 3 to 4 weeks after the petals have dropped, when the first-brood larvæ commence to hatch; third, 10 weeks after the petals have dropped, when under normal seasons the first larvæ of the second brood commence to appear. During advanced seasons the appearance of the second brood may be as early as 9 weeks and only very exceptionally 8 weeks after the petals have dropped, as noted in 1911.

The gooseberry gall midge or bud deformer (*Rhopalomyia grossulariae*), J. S. Houser (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 189-184, pls. 2).—The gooseberry gall midge is a new pest which first came to attention during the summer of 1906 on a farm at Camp Chase, Ohio, and is not known to occur elsewhere.

The gooseberry is seriously injured by the larvæ, which develop in the terminal buds of spurs and branches, causing the buds to become abnormal both in size and structure. The bud scales increase greatly in numbers and size and, lying closely one upon another, form a gall somewhat resembling in miniature the pine-cone willow galls so commonly encountered upon the tips of willow twigs. The injured bud is incapable of producing normal leaves and the plant, striving to maintain itself, develops secondary buds within or about the first. These in turn become infested and there is formed ultimately a large knot or cluster of galls.

The adults are said to appear during the early part of May, the eggs being deposited within a few hours after emergence and hatching apparently within a few days. The transformation from the larval to pupal stage is said to take place about April 1. The remedy consists in cutting out and burning the gall clusters during the fall or winter.

The time when wheat should be sown to escape the fall brood of Hessian fly, T. J. HEADLEE (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 98-109, figs. 2).—The author discusses the existence of a ratio between the difference existing between the theoretical and actual dates of safe sowing and the variation in the normal annual precipitation. The ratio appears to be about 1 day to the inch, being 1 day earlier if the rainfall is 1 in. greater and 1 day later if 1 in. less. It is considered quite probable that this ratio may not hold where the precipitation reaches more than 40 in., but it must be taken into consideration where the rainfall is 40 in. or less.

Some problems of mosquito control in the Tropics, A. H. JENNINGS (*Jour. Econ. Ent.*, 5 (1912), No. 2, pp. 131-142).—Papers relating to this subject by Darling have previously been noted (E. S. R., 24, pp. 660, 755; 27, p. 265).

The Mediterranean fruit fly (*Ceratitis capitata*), A. L. QUAINANCE (*U. S. Dept. Agr., Bur. Ent. Circ.* 169, pp. 25, fig. 1).—This summarized account of our knowledge of the Mediterranean fruit fly, which has recently become established in Hawaii, includes accounts of its destructiveness, life history and habits, natural enemies, and preventive and remedial measures.

A bibliography of the more important literature is appended.

The manipulation of the wax scales of the honey bee, D. B. CASTEEL (*U. S. Dept. Agr., Bur. Ent. Circ.* 161, pp. 13, figs. 7).—This paper, based upon observations made during the summer of 1911 at the apiary of the Bureau of Entomology, presents an account of the manner in which the scales of wax are transported from their pockets to the comb and points out some of the causes which lead to diversity in scale number and scale form.

The author finds that usually the scales are removed by the bee which secretes them and by this bee are masticated and added to the comb. The workers never assist each other in the process of removal, although free scales may, in some cases, be handled by other workers. As a rule, the scales are removed while the bee is standing on the comb or its support, and the wax thus obtained is applied to the comb near the place where it is removed.

Scales which are removed accidentally or which are dropped during manipulation may be recovered later and built into the comb, but the recovery of free scales is usually not accomplished by the bee which secreted them. Bees which are producing wax may also rework the masticated wax laid down by others. Producing bees may turn to the work of building and sculpturing the comb

either before all their scales are removed or immediately after this has been accomplished."

Parasites of the family Dryinidae, R. C. L. PERKINS (*Hawaiian Sugar Planters' Sta., Ent. Bul. 11, 1912, pp. 5-26, pls. 4*).—This paper is supplementary to those previously noted (E. S. R., 17, p. 477; 19, p. 57). Ten species are described as new to science, a large portion of which were reared from leaf-hoppers.

Two encyrtids, namely, *Echthrogonatopus hawaiiensis*, reared from *Pseudogonatopus perkinsi* and *Chciloncirus javanus*, parasitic on *Paradryinus*, are also described as new to science.

Studies on the biology of the Texas fever tick, H. W. GRAYBILL and W. M. DEWALLEN (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 152, pp. 13*).—This report gives the results of studies made during 1908-9 in continuation of those previously noted (E. S. R., 25, p. 564).

The pear-leaf blister-mite, J. R. PARKER (*Montana Sta. Circ. 16, pp. 115-118*).—A brief popular account of *Eriophyes pyri*, with control measures.

FOODS—HUMAN NUTRITION.

Studies on chicken fat (*U. S. Dept. Agr., Bur. Chem. Circ. 103, pp. 12*).—Three papers are included.

Influence of temperature on the lipolysis of esters, Mary E. Pennington and J. S. Hepburn (pp. 1-3).—Since, as shown by earlier work (E. S. R., 25, p. 767), the acidity of the crude fat increases and the lipase retains its activity in chickens kept at varying temperatures and for varying periods of time after being killed, studies were undertaken to ascertain the influence of temperatures on the lipolysis of esters. Several fat old fowls were killed, cooled, and kept in a refrigerator for 7 days to permit the lipase to become active. An aqueous solution was prepared, toluol being used as a bactericide. The samples were incubated in an incubator at 40° C., in a refrigerator at 15.6 to 20.6°, in a mechanically refrigerated chill room at 0°, and in a mechanically refrigerated freezer at -0.4 to -6.7°, the period of incubation varying between the extremes of 3 days in the incubator and 151 days in the freezer.

"The greatest splitting of the esters by the lipase took place in the incubator, the least in the freezer, and between these two extremes lay the splitting in the refrigerator and in the chill room. . . .

"Although the rate of lipolysis is decreased by a lowering of the temperature, yet lipolysis takes place even at the temperature of the freezer when the reaction mixture is frozen solid."

The hydrolysis of chicken fat by means of lipase, Mary E. Pennington and J. S. Hepburn (pp. 4, 5).—Since lipase occurs in the crude fat of chickens and gives rise to the post-mortem hydrolysis of fat, tests were made to determine the extent of lipolysis of chicken fat in vitro. As shown by the increased acid value, due to the action of lipase, lipolysis took place when a glycerol extract of chicken flesh freed from crude fat by extraction with ether was incubated. When glycerol extract with water added was incubated, the increase in acid due to the action of lipase was more marked. "The glycerol extract by itself gave rise to an increase in acid value of only 0.33, whereas the glycerol extract plus its own volume of water gave rise to an increase in acid value of 0.56. In other words, in the more favorable reaction mixture the same quantity of lipase produced 1.7 as great an hydrolysis as in the less favorable substratum."

The occurrence of catalase, oxidases, and reductases in the fat of the common fowl (*Gallus domesticus*), J. S. Hepburn (pp. 6-12).—According to the

author's experiments here briefly reported, catalase and lipase always occur in the crude fat of chickens. The activity of the catalase is apparently more or less independent of the period of keeping of the chicken after death. Oxidases always occur in the crude fat, peroxidases usually and probably always occur, and reductases may occur.

A study of the enzymes of the egg of the common fowl, MARY E. PENNINGTON and H. C. ROBERTSON, Jr. (U. S. Dept. Agr., Bur. Chem. Circ. 104, pp. 8).—Fresh eggs, fertilized and unfertilized, stale eggs, and eggs of known history kept for varying lengths of time under definite conditions were used, experiments being made to determine the presence of pepsin, trypsin, lipase, catalase and reductase.

The results, according to the authors' conclusions, show that "the lipase content of fresh eggs is quite low and it shows a fairly regular increase as the egg deteriorates. In the case of incubated eggs the increase in lipase content with incubation is more noticeable in the case of fertile eggs than in the case of the infertile, although in both cases it is very evident. Market eggs of unknown history, as we might expect, show considerable variation in lipase content. Storage eggs, after 2 months at 32° C., showed an increase in lipase, although at the end of another month there had been no further increase.

"A number of determinations were made of the catalase content of incubated eggs both fertile and infertile. The increase in catalase is great in the first case and far less in the second; in fact, in some cases infertile eggs, heated for several weeks, showed little more catalase than the average for the fresh eggs, while fertile eggs, at the end of a week, showed a catalase content ten times as great.

"The catalase content of fresh eggs is somewhat variable. . . . There is evidence, although it is not conclusive, that in the fresh fertile egg it is higher than in the fresh infertile egg, the eggs obtained in spring showing a higher enzyme content than autumn eggs. The former were found to be about 90 per cent fertile, while the latter were nearly 60 per cent infertile. Again, the factor of the strength and vigor of the hen in the early spring months may affect the catalase content of the egg. It is generally conceded that early eggs give strong chicks, and they are also most desirable for storage purposes. More work on this phase of the problem is highly desirable.

"In the case of market eggs of unknown history the catalase content is naturally variable. Storage eggs, after several months at 32° C., showed a slight increase.

"Several experiments have indicated that the greater proportion of catalase is in the white of the egg, although it is not absent from the yolk. This will be further investigated.

"Several determinations were made of the catalase content of canned eggs put up under excellent conditions and hard-frozen for several months. In general, the amount present was not greater than in the fresh egg.

"The amount of loosely bound nitrogen in incubated eggs, as determined by the Folin method [which is of value in determining the progress of deterioration of eggs as well as of flesh], shows an interesting change. In the case of infertile eggs a very noticeable and quite regular increase takes place with time, while in the case of the fertile eggs the increase is very slight. Considering the content of loosely bound nitrogen as a criterion of protein decomposition, this is not surprising, since in the first case heat would be expected to increase catabolic processes, making for simpler nitrogen compounds, while in the second case it introduces metabolic or upbuilding processes."

Ovomucoid and sugar in the white of birds' eggs, C. T. MÖRNER (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 80 (1912), No. 6, pp. 430-473).—Domestic poultry and wild birds were used in this investigation.

Bob veal and the public, P. A. FISH (*Amer. Vet. Rec.*, 41 (1912), No. 2, pp. 178-185).—Experiments are reported in which bob veal was compared with market veal and with beef in respect to freezing point, specific gravity, and percentage of water.

The freezing point method seemed more sensitive and reliable than the other methods tested. Comparing averages, it was found that the freezing point of bob veal up to 14 days old was from 0.1 to 0.11° less than market veal and beef.

Although the experiments indicate "quite a satisfactory line of demarcation between the younger bob and older veal, there are occasional individual exceptions, and the method [of distinguishing between old and young veal] as yet can not, therefore, be declared infallible."

Dietetic experiments were also carried on in which bob veal was eaten in 7 families aggregating 20 individuals ranging from 2 to 60 years of age. "The statement that the flesh of bob veal has a laxative effect and induces diarrhea has not been confirmed in a single instance throughout our work. The health in all cases was apparently normal; nor did any family refuse a second helping when another carcass became available.

"In all veal there is a deficiency of fat as compared with beef. In bob veal this deficiency is naturally somewhat more pronounced, because fat is a result of growth and age under proper nutritive conditions. In the use of bob veal this deficiency may be overcome to a considerable extent by cooking the veal with pork or other fat."

The author is of the opinion that bob veal is in no way injurious when used as human food.

The existing legal restrictions regarding the sale of very young veal and the desirability of changes in such regulations are discussed.

The pickling and curing of meat in hot weather, G. W. CARVER (*Alabama Tuskegee Sta. Bul.* 24, pp. 22).—Directions are given for pickling and curing meat, together with a number of recipes for cooking pork.

Studies of flour, I, R. FANTO (*Ztschr. Untersuch. Nahr. u. Genussmit.*, 24 (1912), No. 4, pp. 269-274, figs. 2).—Studies are reported of the proportion of the total nitrogen of wheat and rye flour which is soluble, and also the results of tests of the viscosity of water extracts.

Studies on wheat flour.—II, Artificial flour improvers, H. JESSEN-HANSEN (*Ztschr. Gesam. Getreidew.*, 4 (1912), No. 10, pp. 271-277).—The different flour improvers which have been suggested are considered to owe any value they possess to the increase which they produce in the hydrogen ion concentration. Other conclusions confirm previous findings (*E. S. R.*, 27, p. 166).

Report from food laboratory (*Ann. Rpt. Ind. Bd. Health*, 29 (1910), pp. 222-296, fig. 1).—Data are given regarding the examination of a number of samples of milk, ice cream, lard, and other materials.

Report of sanitary inspections (*Ann. Rpt. Ind. Bd. Health*, 29 (1910), pp. 297-311, fig. 1).—A progress report.

Notices of adulteration or misbranding (*Kentucky Sta. Food and Drug Bul.*, 1912, cases 5118-5249, pp. 49-144).—These notices have to do with the adulteration and misbranding of bakers' materials, milk deficient in butter fat and containing added water, cream adulterated and deficient in butter fat, etc.

Report of industrial investigations in Basle, edited by S. BAUER (*Basler Volkswirtschaftliche Arbeiten. Stuttgart*, 1911, vol. 2, pp. XX+315).—This report contains two papers, and an introduction by S. Bauer.

The food of German laborers and its cost, H. LICHTENFELT (pp. 1-90).—This paper contains the results of an exhaustive study of the income and disbursements of laboring men of various occupations in different German provinces. Considering average values, the digestible protein varied from 61.3 to 89.2 gm per man per day; the digestible fat and carbohydrates with the smaller amount of protein being, respectively, 64.2 and 551.6 gm., and with the larger amount of protein, 113.9 and 618.8 gm.

Consumption and increased prices discussed on the basis of Basle budgets, F. KRÜMMELBEIN (pp. 91-315).—A large amount of data is summarized and discussed.

The nutritive value considered from a biological standpoint of foodstuffs denaturalized by high temperature, A. SUTJMA (*Arch. Hyg.*, 75 (1912), No. 6-7, pp. 235-267, *dyms.* 8).—Experiments undertaken to determine whether there were differences in the physico-chemical properties of food in its usual condition and denaturalized by heating at a high temperature which would affect the digestive processes led to the conclusion that gastric digestion was much slower with the cooked than with the uncooked fish (sardines). Differences were not observed, however, when digestion as a whole was considered.

Artificial digestion experiments showed that the cooked fish required a much longer time for digestion than the raw. The favorable effect of the enzymes present in the raw fish was considered. When the material was kept on ice its enzymic properties were retained for a long time without loss.

Autodigestion experiments with raw and cooked sardines are also reported.

Effects of fruit juices on metabolism, T. LAURENTI (*Policlin.*, Sez. Med., 1 (1911), No. 12, pp. 549-568; *Jour. Amer. Med. Assoc.*, 58 (1912), No. 6, p. 452).—Except for a slight effect in the case of lemon juice the author did not find that fruit juices exercised any special influence on the amount of urine, its specific gravity, or the total ammonia output. However, in nearly every experiment and during the supplemental period the total nitrogen was increased and the uric acid considerably increased. The effect of fruit juices did not seem to be directly proportional to their acidity.

Experiments on the biological value and metabolism of protein.—III. The rôle of chlorin in protein metabolism, A. JAFFELLI (*Arch. Fisiol.*, 10 (1912), No. 2, pp. 129-149; *abs. in Zentbl. Expt. Med.*, 1 (1912), No. 10, pp. 445, 446).—Experiments with dogs showed that the chlorin metabolism on a ration supplying only the necessary quantity of chlorin was dependent upon the character of the food, even though the chlorin content varied slightly.

Experiments on the biological value and metabolism of protein.—IV. Are serum proteid bodies the normal nitrogenous tissue nutrients? G. QUAGLIARIELLO (*Arch. Fisiol.*, 10 (1912), No. 2, pp. 150-174; *abs. in Zentbl. Expt. Med.*, 1 (1912), No. 10, pp. 446, 447).—According to the author's conclusions, serum proteid as such is not sufficient to maintain the normal tissue metabolism.

The action of gastric juice on zein and gliadin, II, S. BAGLIONI (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat.*, 5, ser., 19 (1910), I, No. 8, pp. 512-517; *abs. in Ztschr. Untersuch. Nahr. u. Genussmitl.*, 23 (1912), No. 12, p. 696).—According to the artificial digestion experiments reported, zein shows a much greater resistance to digestion than gliadin. Gliadoses by long-continued action of gastric juice are changed into complicated bodies, while zeoses remain unchanged. See also a previous note (E. S. R., 20, p. 663).

Concerning fat metabolism, E. FREUDENBERG (*Biochem. Ztschr.*, 45 (1912), No. 5-6, pp. 467-487).—Autolysis of rabbit liver under aseptic conditions showed that neutral fat underwent a cleavage which was quantitative with

fat content of 2 per cent. If heated the liver lost this property. Other organs showed the same property but in much less degree, so, according to the author, the liver has a special place in fat metabolism.

Data are also reported regarding the fat content of the blood.

The antineuritis bases of vegetable origin in relationship to beri-beri, with a method of isolation of torulin, the antineuritic base of yeast, E. S. FLETCHER AL. (*Bio.-Chem. Jour.*, 6 (1912), No. 3, pp. 231-242).—The authors studied rice bran and Katjang beans, the former giving somewhat favorable results, while the attempt to isolate an active substance from the beans which would possess curative effects in pigeons disabled with polyneuritis from rice meal feeding proved unsuccessful.

Natural yeast having been found previously to possess marked preventive and curative properties, extracts from yeasts were next investigated, and the authors succeeded in isolating an organic compound in the form of fine feathery crystals for which the following formula is suggested: $N(C_2H_5)_3.C_6H_5O_2.(HNO_2)$. This substance, which they propose to call torulin, showed marked antineuritic properties. It is proposed to investigate the material further.

Calorimetric observations, G. LUSK (*Med. Rec.* [N. Y.], 82 (1912), No. 21, pp. 925-928, fig. 1).—From respiration calorimeter experiments with a dog, quiet or sleeping, and excluded from thermal influences, the following general conclusions were drawn regarding metabolism:

There was found "a basal metabolism when the cells are nourished by a blood stream which does not receive food from the intestinal tract and the composition of which is regulated by the organs of the body; a metabolism due to plethora induced by an increased quantity in the blood of carbohydrate or fat metabolites which are being absorbed from the intestines; a metabolism due to the stimulus of incoming amino acids acting upon the cells.

"The metabolism of plethora and the metabolism of amino acid stimulation can not be added to each other; there is no summation of effect when both influences are brought into action together. In other words, cellular activity induced by the presence of carbohydrate is not further intensified by the stimulus of amino acids unless the latter alone would accomplish the result.

"The height found for the basal metabolism of the perfectly quiet resting organism, excluded from thermal influences and determined 18 hours after the ingestion of food, confirms Rubner's law of skin area, but places the heat elimination at a lower level."

The heat production per square meter of surface area in one dog was found to be 759 calories, calculated as for a period of 24 hours, and in another 784 calories. In a dwarf 17 years old and weighing 21.3 kg. it was 775 calories.

"In sleeping infants, however, the basal metabolism reached 1,100 calories per square meter of surface, and here the metabolism was also shown to be especially sensitive to protein ingestion (amino acid stimulation), indicating that a high metabolism is characteristic of youthful protoplasm.

"As a practical conclusion of these experiments, it appears that in a quiet and resting animal the heat production is increased by about 20 per cent after the ingestion of a mixed diet, and this increase continues during the period of intestinal absorption; also addition of moderate amounts of protein to the diet has little effect upon the production of heat, even though this protein given alone would of itself cause a considerable rise in the heat production. Hence, a mixed dietary is physiologically economical.

"Experiments are soon to be undertaken to establish the validity of the conclusions set forth in this paper as regards man both in health and disease."

ANIMAL PRODUCTION.

Yearbook of scientific and practical animal breeding, edited by G. WILSON and R. MÜLLER (*Jahrb. Wiss. u. Prakt. Tierzucht*, 6 (1911) pp. VII+384 figs. 32).—Part 1 of this yearbook contains articles by Bormann and Balzer previously noted (E. S. R., 26 pp. 471, 667), and articles by Iwanoff and Becker (noted below). Part 2, as usual, consists of abstracts of articles on zootechnology and part 3 includes miscellaneous notes on various matters of interest to breeders of live stock.

The zoological garden of F. Falz-Fein, E. Iwanoff (*Jahrb. Wiss. u. Prakt. Tierzucht*, 6 (1911), pp. 39-52, figs. 18).—This is an account of hybrids between *Equus chapmanii* and *E. caballus*, *E. caballus* and *E. przewalskii*, *Bos taurus* and *Bison americanus*, and *Bos taurus* and *Bison bonasus*.

Evidence of alternative inheritance in the F₂ generation from crosses of Bos indicus on B. taurus, R. K. NABOUBS (*Amer. Nat.*, 46 (1912), No. 547, pp. 428-436, figs. 9).—This is a preliminary report on crosses of *B. indicus*, imported to Texas, with other breeds of cattle. The color patterns of the Herefords and Durhams were dominant in the F₁ generation. It is thought that the hump, large sheath, and dewlap of the zebu follow the law of alternative inheritance when the parent strains are pure. The hybrids are about 5 per cent larger than the ordinary native range cattle.

Correlation between the lung, heart, and size and weight of the body in Simmental and Oldenburg breeds of cattle, W. BECKER (*Jahrb. Wiss. u. Prakt. Tierzucht*, 6 (1911), pp. 53-114).—The author gives the results of measurements made of living and slaughtered animals. A bibliography is appended.

Fancy points in animal breeding, E. N. WENTWORTH (*Country Gent.*, 7 (1912), No. 41, p. 6, fig. 1).—It is pointed out that too much attention has been paid to fancy points in breeding animals, although some cases are cited in which they are associated with economic qualities.

Regeneration and related processes, D. BARFURTH (*Fortschr. Naturw. Forsch.*, 6 (1912), pp. 153-142).—This reviews investigations on the regeneration of tissues, lost organs, transplantation of tissues, and their relation to the embryonic growth of new individuals. A bibliography of over 400 titles is appended.

The action of adrenalin and cholin on the determination of sex, R. ROBINSO (*Compt. Rend. Acad. Sci. [Paris]*, 154 (1912), No. 24, pp. 1634-1636).—A continuation of earlier work (E. S. R., 26, p. 773).

The author found that subcutaneous injections of adrenalin hydrochloride increased the proportion of males in guinea pigs. Adrenalin caused a reduction and cholin an increase in the weight of the animals treated. Several cases in humans are reported in which it is claimed that sex could be determined by the presence or absence of adrenalin in the urine of the parent.

The influence of standing or lying upon the metabolism of cattle, H. F. ARMSBY and J. A. FRIES (*Orig. Commun. 3. Internat. Cong. Appl. Chem. [Washington and New York]*, 15 (1912), Sect. VII, pp. 23-33).—A preliminary report of results of testing new appliances devised in order that separate determinations of carbon dioxide and water vapor might be made in the interval of standing or lying. The average percentage of increase in standing over lying was as follows: Carbon dioxide 31.3, water vapor 33.1, total heat 36.5 and radiated heat 37.2 per cent. The influence of standing or lying upon the excretion of carbon dioxide was much greater than in experiments observed by Hagemann or Dahm.

It is concluded that the increased heat emission by cattle during standing, which has been invariably observed in these experiments, represents substantially the increased heat production during the same time.

The combustible gases excreted by cattle, J. A. FRIES (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 109-119*).—This contains results of 57 respiration calorimeter experiments with steers.

There was a great variation in the daily quantities of hydrogen and carbon given off in the form of combustible gases, ranging from 5.445 gm. of hydrogen and 19.477 gm. of carbon to 49.152 gm. of hydrogen and 150.697 gm. of carbon. There was also a great variation in the ratio of hydrogen to carbon, the average being 1:3.167. The bulk of the feed and the length of time which it remained in the animal's body, especially in the rations containing alfalfa hay, appeared to influence the composition of the combustible gases produced.

"The amount of combustible gases increases with increase in quantity of feed eaten. The production of combustible carbon is relatively greater with the smaller rations. In percentage of the total carbon given off in carbon dioxide, the combustible carbon increases with the increase in the rations. The individuality of the animals does not seem to have any marked influence upon the production of combustible gases. A tendency for higher percentage of carbon to hydrogen is noticed with the smaller rations, but this is especially marked in the rations containing alfalfa hay."

Composition and digestibility of ether extract of hays and fodders, G. S. FRAPS and J. B. RATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 105-107*).—"The ether extract of hays and fodders contains on an average 58 per cent unsaponifiable material, chiefly wax alcohols. The unsaponifiable material is digested to a much less extent than the saponifiable matter, which includes chlorophyll and fatty acids. The low digestibility of the ether extract of hays and fodders is due largely to the presence of large proportions of nonfats, which are not as easily digested as the fats."

Composition and digestibility of the chloroform extract of plants, G. S. FRAPS and J. B. RATHER (*Orig. Commun. 8. Internat. Cong. Appl. Chem. [Washington and New York], 15 (1912), Sect. VII, pp. 103, 104*).—"The chloroform extract of hays and fodders is about 60 per cent as much as the ether extract previously made on the same samples. The chloroform extract consists largely of chlorophyll and other weak acids, though it contains fatty acids and wax alcohols also. The chloroform extract has a higher digestibility than the ether extract."

Steer feeding in Alabama, D. T. GRAY and W. F. WARD (*Alabama Col. Sta. Bul. 163, pp. 57-133, figs. 11*).—This bulletin, which reports results of feeding experiments conducted under actual farm conditions in Sumter County, Ala., by the Alabama Station in cooperation with the Bureau of Animal Industry of this Department, is divided into 4 parts.

I. **Winter fattening of steers on cotton-seed meal, cotton-seed hulls, corn silage, and Johnson-grass hay** (pp. 59-77).—In an experiment during the winter of 1909-10 60 grade Hereford, Aberdeen-Angus, and Shorthorn steers from 2 to 3 years old were fed for 84 days. During the first 28 days each lot received a daily ration of 4.84 lbs. of cotton-seed meal per head, which was increased to 6 lbs. for the next 28 days and to 7.73 lbs. for the last 28 days. In addition all lots were fed cotton-seed hulls during the whole period, and for the first 56 days lot 1 was fed corn silage and lot 2 Johnson-grass hay for the full period. At the end of 56 days, when the silage supply gave out, the average daily

gain per head for the silage-fed steers was 1.86 lbs., which was made at a cost of 7.98 cts. and a consumption of 2.87 lbs. of cotton-seed meal per pound of gain. The lot fed Johnson-grass hay had gained 1.43 lbs. each daily at a cost of 11.88 cts. and a consumption of 3.72 lbs. of cotton-seed meal per pound of gain. The lot fed the cotton-seed meal and hulls had gained 1.89 lbs. each daily at a cost of 8.8 cts. and a consumption of 2.8 lbs. of cotton-seed meal per pound of gain. For the whole 84 days the daily gains per head were for lot 1, 1.8 lbs.; lot 2, 1.54 lbs.; and for lot 3, 1.71 lbs.

II. *Wintering steers preparatory to summer fattening on pasture* (pp. 78-105).—In continuation of work previously noted (E. S. R., 25, p. 72) 2 experiments are here reported. In the first, 35 2-year-old grade Shorthorn and Aberdeen Angus steers weighing about 616 lbs. each were used. The winter rations, which were intended to carry the steers through in condition to be fattened in summer, were for lot 1, 2.35 lbs. cotton-seed meal and 13.25 lbs. cotton-seed hulls each daily, and for lot 2, 2.35 lbs. cotton-seed meal, 6.82 lbs. cotton-seed hulls and 5.5 lbs. Johnson-grass hay. On these rations for 116 days the steers in lot 1 made an average daily gain of 0.64 lb. each at a cost of 12.05 cts. per pound, and those in lot 2, 0.59 lb. at a cost of 14.71 cts. per pound. In the spring of 1910 these 2 lots were combined and fattened on a sandy loam pasture that afforded an abundance of grass. In addition to pasturage they were fed per head per day 2.19 lbs. cotton-seed cake at the beginning which was gradually increased to 6 lbs. toward the end of the period. During this period, 147 days, the steers made an average daily gain of 1.14 lbs. each at a cost of 7.06 cts. per pound. For the whole period, winter and spring, the steers of lot 1 were fed at a loss of \$4.97 each, and those of lot 2 at a loss of \$5.95 each.

In another test 43 common steers of the neighborhood from 3 to 4 years old weighing 565 lbs. each were used. These steers cost in the fall of 1909 \$2.25 per hundredweight. During the winter they had the run of a 20,000-acre range and received no additional feed. Under these conditions they made an average daily gain of 0.08 lb. each. At the close of this period these steers were divided into 2 lots and fattened on pasture for the late summer market. In addition to pasturage lot 1 was fed 2.84 lbs. cotton-seed cake each daily, which was gradually increased to 5 lbs. toward the close of the period; lot 2 received nothing in addition to pasturage. During this period, 113 days, lot 1 made an average daily gain of 1.42 lbs. each at a cost of 4.82 cts. per pound, and lot 2, 1.33 lbs. each at a cost of 1.55 cts. per pound. A profit of \$9.97 per steer was realized on lot 1 and \$11 per steer on lot 2. In figuring the cost of gains profits, and losses, cotton-seed meal and cake were charged at \$26 each, cotton-seed hulls \$7, and Johnson-grass hay \$11 per ton; pasturage 50 cts. per steer per month, and range nothing.

III. *The value of shelter for fattening cattle in Alabama* (pp. 106-116).—A report of feeding experiments conducted during the winter of 1910-11. In continuation of work already noted (E. S. R., 19, p. 1067) a mixed lot of 67 steers, heifers, and cows of poor quality from 2 to 4 years old were divided into 2 lots. Lot 1 was confined in a small inclosure across one side of which extended an open shed, and lot 2 was fed on a 5-acre tract of sandy land with no shelter. The rations for each lot were cotton-seed meal and hulls, about 4½ lbs. meal per head daily being fed at first, which was gradually increased to about 5½ lbs. with no ill effects. The test lasted 103 days. The cattle in lot 1 gained 1.71 lbs. each daily at a cost of 7.06 cts. per pound, and made a profit of \$6.88 each. Those in lot 2 gained 1.67 lbs. each daily at a cost of 7.72 cts. per pound and made a profit of \$7.48 each, cotton-seed meal being charged at \$26 and hulls at \$7 per ton.

IV. *Early compared with late fattening of steers on pasture* (pp. 117-133).—These pages report the results of feeding tests with 224 steers on pasture during the 3 years 1909-11. The steers were mostly grade Aberdeen-Angus, Short-horn, Hereford, and Red Polled, though a few had a predominance of Jersey and scrub breeding. The steers in the long-fed lots were given from 2.21 to 2.88 lbs. of cotton-seed cake at the beginning of the tests, while those in the short-fed lots received from 3.24 to 3.40 lbs. each daily. At the close of the test each steer in the long-fed lots was consuming from 3½ to 4 lbs. of cake, while those in the short-fed lots were consuming an average of 5 lbs. daily. An abundance of pasture was supplied for each lot, the short-fed steers being put on pasture and marketed earlier than the long-fed steers. The following table gives some of the results obtained:

Summary of 3 years' tests in fattening steers on pasture.

SHORT-FED STEERS.

| Number of steers. | Length of feeding period. | Year. | Average initial weight of steers. | Average daily gain. | Cost per pound gain. | Profit per steer. |
|-------------------|---------------------------|-----------------|-----------------------------------|---------------------|----------------------|-------------------|
| 35 | Days. 140 | 1909 | Pounds. 723 | 1.96 | 3.75 | \$8.25 |
| 30 | 91 | 1910 | 668 | 2.21 | 3.32 | 9.90 |
| 25 | 128 | 1911 | 661 | 1.66 | 4.02 | 6.81 |
| 90 | | 3-year, average | | 2.04 | 3.69 | 8.50 |

LONG-FED STEERS.

| | | | | | | |
|-----|-------|-----------------|-------|------|------|--------|
| 75 | 154 | 1909 | 639 | 1.88 | 3.24 | \$4.91 |
| 34 | 119 | 1910 | 576 | 1.96 | 3.24 | 11.00 |
| 25 | 140 | 1911 | 565 | 1.72 | 3.70 | 6.48 |
| 134 | | 3-year, average | | 1.87 | 3.33 | 7.73 |

Feeding beef cattle in Alabama, D. T. GRAY and W. F. WARD (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 159, pp. 56*).—This comprises, with slight changes, the text of the bulletin noted above.

Cotton-seed meal and corn silage feeding experiments with beef cattle, L. S. CURTIS (*North Carolina Sta. Bul. 222, pp. 115-132, figs. 5*).—In continuation of work already reported (*E. S. R., 25, p. 873*) results are here given of tests to determine the most profitable amount of cotton-seed meal to feed daily to beef cattle, and to compare further the relative value of cotton-seed hulls, corn stover, and corn silage when fed in connection with cotton-seed meal. In his test 35 western North Carolina steers, medium grade feeders about 2½ to 3 years old and mostly grade Shorthorns, were used. The preliminary feeding period lasted 40 days and the final period 122 days. The steers were divided into 5 lots of 7 steers each, and during the whole experiment no steer was off feed at any time. The preliminary rations consisted of roughage for the first 40 days, after which they were fed cotton-seed meal, cotton-seed hulls, corn stover, and oat hay, the cotton-seed meal being gradually increased until 1 week before the beginning of the test, when all lots were put on the experimental rations. During the final period the daily amounts of cotton-seed meal fed per steer were as follows: Lots 1, 3, and 5. 7.53 lbs.; lot 2, 6.05 lbs.; and lot 4, 3.07 lbs. In addition lot 1 received 26 lbs. of cotton-seed hulls; lots 2, 3, and

4, 12.7 lbs. corn stover and 13.8 lbs. silage; and lot 5, 30.6 lbs. silage per steer daily. In figuring profits the feeds were rated per ton as follows: Cotton-seed meal \$26, cotton-seed hulls \$6, corn silage \$3, and corn stover \$10. Manure was rated at \$2 per ton. The initial value of the steers, 3.80 cts. per pound, was their actual cost in the mountains, and the final values were the estimates of 3 disinterested parties.

The following table gives some of the results obtained:

Summary of results from feeding beef cattle on various rations.

| Lot | Ration | Average daily gain per steer. | | | | | | Cost per pound of gain. | Final valuation of steers, per pound. | Manure produced. | Profit per steer. |
|-----|---|-------------------------------|--------------|---------------|--------------|---------------|---------------|-------------------------|---------------------------------------|------------------|-------------------|
| | | Initial weight per steer. | First month. | Second month. | Third month. | Fourth month. | Whole period. | | | | |
| 1 | Cotton-seed meal and hulls... | Lbs. 975.7 | Lbs. 2.28 | Lbs. 2.24 | Lbs. 0.54 | Lbs. 0.01 | Lbs. 1.28 | Cts. 13.74 | Cts. 5.50 | Tons. 47.19 | \$2.90 |
| 2 | Cotton-seed meal, stover, and silage... | 909.3 | 1.47 | 2.19 | 1.56 | .64 | 1.46 | 12.44 | 5.75 | 51.01 | 5.49 |
| 3 | " " " " " " | 800.6 | 1.96 | 1.98 | 1.67 | .80 | 1.60 | 12.54 | 5.75 | 50.86 | 3.65 |
| 4 | " " " " " " | 905.0 | 1.77 | 2.49 | 1.33 | .94 | 1.64 | 13.46 | 5.75 | 35.65 | 1.79 |
| 5 | Cotton-seed meal and silage... | 800.0 | 2.21 | 1.83 | 2.06 | .64 | 1.69 | 9.87 | 6.00 | 42.11 | 11.11 |

It is stated that lot 1 had a dry, harsh condition at the finish, and that the other cattle, especially lot 5, had a smooth, mellow finish. "Because of the kind of rations and the way in which the preliminary feeds were given, the lot fed cotton-seed hulls for roughage had the advantage over all the other lots. No change was necessary in their ration, either in kind or quantity of feed at the beginning of the experimental period. This makes the results still more conclusive regarding the comparative value of the dry and succulent roughage feeds."

From these results the indications are that corn silage will almost replace cotton-seed hulls pound for pound at practically one-half the cost for roughage.

Winter steer feeding, 1909-10 and 1910-11, J. H. SKINNER, F. G. KING, and H. P. RUSK (*Indiana Sta. Bul.* 153, popular ed., pp. 3-24).—A popular edition of a bulletin previously noted (*E. S. R.*, 26, p. 568).

Selecting steers for feeding, J. L. TORMEY (*Wisconsin Sta. Bul.* 224, pp. 4-30, figs. 13).—This bulletin deals in a practical way with the questions that arise with reference to the economical production of beef on Wisconsin farms. The points dealt with are the type of cattle to keep for beef, how to build up a beef herd, selecting feeding cattle, classes and grades of cattle on the market, how and when to get feeders, the feeding margin, the feeding period, hogs following steers, and marketing.

Lowering the cost of beef production, A. GOVIN and P. ANDOUARD (*Bul. Soc. Nat. Agr. France*, 72 (1912), No. 6, pp. 489-497; *Rcv. Gén. Agron.*, n. s., 7 (1912), No. 7, pp. 261-266).—This contains data on the growth of calves up to 18 months of age, and discusses the most profitable age at which to slaughter.

Economic factors in cattle feeding.—I, Relation of the United States to the world's beef supply, H. W. MCMFORD and L. D. HALL (*Illinois Sta. Circ.* 163, pp. 11, figs. 5).—This circular, treating of the relation of the United States to the world's beef supply, is the first of a series which will deal with other aspects of the subject. The statistics given have been noted from other sources, and show that unless a rapid increase in cattle raising occurs in this country, exports of cattle must soon cease.

Sheep raising, R. S. CURTIS (*North Carolina Sta. Bul.* 223, pp. 5-39, figs. 10).—A popular presentation of the subject, in which breeds, care and management, and some of the common ailments of sheep are dealt with. Greater attention to this profitable industry in the Piedmont and mountainous regions of the State is urged.

Growing and marketing wool, W. C. COFFEY (*Illinois Sta. Circ.* 161, pp. 16, 206, 50).—Directions are given for the production of a desirable quality of wool in the condition most satisfactory to the market.

Hog raising for the Idaho farmer, W. L. CARLILE and E. J. IBBINGS (*Idaho Sta. Bul.* 7, pp. 3-31, figs. 9).—This bulletin reports results of several feeding experiments testing the value of Idaho feeds for pork production, gives suggestions and practical information to the beginner, and outlines approved methods of management, including a floor plan of a hog house. The following table summarizes the results of the feeding experiments, the feeds being charged at the following prices per hundredweight: Ground wheat, \$1.25; cracked corn, \$1.40; wheat shorts, \$1.10; rolled barley, \$1.10; high protein tankage (60 per cent protein), \$2; low protein tankage (34.64 per cent protein), \$1.50; field peas, \$1.50; and soy-bean meal, \$1.00:

Summary of feeding tests with pigs.

| Rations. | Number of pigs. | Weight of pigs. | Number of days in test. | Daily gain per pig. | Cost per pound gain. |
|---|-----------------|-----------------|-------------------------|---------------------|----------------------|
| | | Lbs. | | Lbs. | Cts. |
| Wheat, ground corn, shorts (2:1:1)..... | 8 | 67.3 | 98 | 1.18 | 5.46 |
| Wheat, ground corn, shorts, tankage (2:1:1:1)..... | 8 | 75.5 | 98 | 1.38 | 5.81 |
| Shorts, rolled barley, and ground corn (4:2:1)..... | 12 | 74.5 | 105 | 1.29 | 5.90 |
| Shorts, rolled barley, and field peas (4:2:2)..... | 12 | 73.7 | 105 | 1.35 | 6.00 |
| Shorts, rolled barley, and soy-bean meal (4:2:1)..... | 12 | 71.9 | 105 | 1.28 | 6.06 |
| Shorts, rolled barley, and tankage (60 per cent protein) (8:4:1)..... | 12 | 72.6 | 105 | 1.40 | 5.59 |
| Wheat and tankage (34.64 per cent protein) (11:1)..... | 8 | 116.3 | 56 | 1.45 | 5.52 |
| Wheat and soy-bean meal (11:1)..... | 8 | 117.6 | 56 | 1.37 | 5.75 |

Hog management in Montana, R. W. CLARK and H. P. GRIFFIN (*Montana Sta. Circ.* 13, pp. 55-77, figs. 8).—This circular gives popular directions for the management of pigs, including housing, pens and pastures, maintenance and health of stock, and feeding.

Poultry raising in Macon County, Alabama, G. W. CARVER (*Alabama Tuskegee Sta. Bul.* 23, pp. 3-20, figs. 4).—The purpose of this bulletin is to suggest ways and means for profitable poultry raising in Alabama. Special attention is given to different methods of feeding and avoiding the diseases most prevalent among fowls. The egg record and the expense account of a flock of Barred Plymouth Rocks are given.

Chick feeding, W. F. SCHOPPE (*Montana Sta. Circ.* 18, pp. 6).—An outline of the plan used by the Montana Station for feeding chicks, including grain mixtures for chicks of different ages, and directions for the preparation of a cresol solution for disinfecting brooders, incubators, etc.

Is there an egg type of the domestic hen? D. E. HALE (*Rel. Poultry Jour.*, 19 (1912), No. 5, pp. 782, 783, 828, 829, figs. 2).—A description of the correlation between form and function of prolific layers.

Does feeding antimony to geese produce fatty liver? POPPE and POLENSKE (*Arch. K. Gsndhtsamf.*, 38 (1912), No. 2, pp. 155-161; *abs. in Deut. Landw. Presse*, 39 (1912), No. 7, p. 68; *Internat. Inst. Agr. [Rome], Bul. Bur. Agr. Intel. and Plant Diseases*, 3 (1912), No. 3, pp. 746, 747).—From 1 to 2 gm. of

a mixture of pure antimony sulphid and ordinary antimony per head per day did not appear to affect unfavorably the condition of the birds. When antimony or arsenic was fed to geese small quantities could be detected in the livers, but the amount seemed to be influenced by the individuality of the bird. The size and weight of the liver were not affected.

[Report of the Association of Feed Control Officials] (*Amer. Hay, Flour, and Feed Jour.*, 22 (1912), No. 1, pp. 19-35, 44, figs. 8).—This reports in full the proceedings of the meeting, noted on another page. The following papers were read: The president's address, by W. J. Jones, Jr. (pp. 19-21); report of the executive committee, by C. D. Woods (pp. 21, 22, 32-35); Cotton-seed Meals and Their Manufacture, by R. E. Stallings (pp. 22, 23); Gluten Feeds and Their Manufacture, by H. C. Humphrey (pp. 23-26); State Legislation Affecting Commercial Feeding Stuffs, by G. L. Flanders (pp. 26-28); Oat By-products: Their Value and Conservation, by F. D. Fuller (pp. 28-30); and Utilization of By-products, by C. S. Miner (pp. 30-32).

DAIRY FARMING—DAIRYING.

The feed unit system for determining the economy of production by dairy cows, F. W. WOLL (*Wisconsin Sta. Circ. Inform.* 37, pp. 15).—This circular gives a brief description of the so-called "feed unit system" which has been developed in north European countries and is now extensively used there, and cites some results of the use of this system in compiling the results of the Wisconsin dairy cow competition. It is urged that the system be adopted by farmers in this country as a means of determining what feeds to grow and of weeding out unprofitable cows from the dairy herd. A table gives a comparison of therms, starch values, and feed units for a number of common feeding stuffs in which the figures for the therms and starch values have been recalculated to the same basis used in the feed unit system.

A short bibliography of feeding experiments in which this system has been used is given.

Dairying in Montana. R. W. CLARK (*Montana Sta. Circ.* 10, pp. 17-36).—A popular discussion of the subject, including directions for computing balanced rations.

The average production per cow for 12 grade Shorthorn cows of the station herd in 1905 was 5,992 lbs. milk and 250 lbs. milk fat, and in 1906, 6,582 lbs. milk and 274 lbs. milk fat. In 1910 the 5 best cows averaged 10,889 lbs. milk and 410 lbs. milk fat each, and the 5 poorest cows 3,556 lbs. milk and 141 lbs. milk fat.

The Wisconsin dairy cow competition, F. W. WOLL and R. T. HARRIS (*Wisconsin Sta. Bul.* 226, pp. 3-36, figs. 15).—This gives the details of the Wisconsin competition (E. S. R., 22, p. 577), in which 56 breeders and farmers entered 448 pure-bred and 58 grade cows, of which 395 made yearly records under the rules governing semifofficial yearly tests.

The net returns ranged from \$154.44 profit to \$6.10 loss per cow, not counting the labor, and averaged \$62.85. Nearly two-thirds of the competing cows produced an average of over 400 lbs. of milk fat. The best cow (a Holstein) gave 21,972.9 lbs. of milk, containing 888.157 lbs. of fat. The first-prize herd of 10 cows averaged 16,044 lbs. of milk and nearly 600 lbs. of milk fat.

The Holsteins averaged more milk and milk fat and higher net returns per cow, but the Jerseys and Guernseys produced more milk fat for the amount of feed eaten. The production of the competing grade cows compared favorably with that of the pure breeds and shows what improvement can be made by the use of a pure-bred sire.

Methods of classifying the lactic-acid bacteria. L. A. ROGERS and B. J. DAVIS *U. S. Dept. Agr., Bur. Anim. Indus., Bul. 157, pp. 39, pgs. 6*.—In view of the need felt by dairy bacteriologists and others of a classification of the lactic-acid bacteria into naturally related groups by means of characters that can be determined with reasonable accuracy and in a manner ordinarily available, a study was made of about 150 cultures isolated from milk, butter, and cheese, derived from various parts of the country, with the object of laying the basis for a satisfactory classification.

It is stated that no one basis of classification can be used for all groups of bacteria, but that certain fundamental principles should govern any method of arrangement, two of the most obvious being that the characters should be constant and that they should be so selected that they show real biological relationships.

With the cultures used in this study the morphology, Gram's stain, cell grouping, in many cases formation of capsule, the nature and amount of growth on lactose-agar slopes and in gelatin stabs, the rate of liquefaction of gelatin, the nature of growth in broth, growth in milk, the reduction of nitrates and of neutral red, and the formation of acid in broth containing various test substances were determined. In these fermentation tests the sugars lactose, dextrose, galactose, saccharose, and raffinose, the alcohols mannite and glycerin, and the polysaccharid inulin were used. The following conclusions are drawn:

"The stability of the fermentation tests is made evident not only by the constancy of the reactions on repeated tests, but also by the marked correlation between different fermentative activities and between the fermentations and other characters. The usefulness of these tests is only apparent when by means of biometrical methods the correlations are established and the cultures are arranged in groups possessing certain characters in common, but in which minor variations from the type are not excluded.

"The test substances used can not be determined arbitrarily. It is probable that it will be desirable to vary the test substances used with different groups of bacteria. We have found raffinose and glycerin and the gelatin test especially valuable, while saccharose, which has long been used for differential tests, has much less value. All of the groups have many cultures fermenting this sugar and there is little correlation with other reactions. While the determination of the fermentation of raffinose or glycerin gives one a good idea of the group in which the culture should be placed, the knowledge that a culture ferments or fails to ferment saccharose is of little assistance.

"It should be remembered that these cultures were all selected on the basis of the possession of a single positive character, the fermentation of lactose. If the collection had been made on a broader basis, it is highly probable that the cultures would have formed other groups around types distinct from those we have found, but related to them by certain common characters and by transition forms.

"The results recorded in this paper are too meager to warrant any attempt at fixing or establishing the place of the lactic-acid bacteria in the bacteriological system, but we believe that this work indicates that future efforts in the direction of systematic bacteriology should be toward the determination of those characters that are significant and enduring rather than in fruitless controversies over the priority or stability of some name based on descriptions so undeterminative that they convey no meaning."

A bibliography of 25 titles is included.

Care of milk in the home. B. R. RICKARDS and H. N. PARKER (*Illinois Sta. Circ. 162, pp. 6*).—Popular hints are given for the care of milk in the home, including brief directions for pasteurization.

The normal composition of American creamery butter, S. C. THOMPSON, R. H. SHAW, and R. P. NORTON (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 149 pp. 31, figs. 4*).—This bulletin reports results of a comprehensive study of the composition of normal American creamery butter and the conditions under which such butter is made. Complete analyses and churning data are given of 695 samples of creamery butter derived from 14 States. In making the analyses fat, water, and curd were determined according to the official methods and the salt by a method devised by C. E. Gray, the details of which are given. The following table gives the average composition of the butter analyzed.

Average composition of 695 samples of American creamery butter.

| Kind of butter. | Number of samples. | Water. | Fat. | Curd. | Salt. |
|-------------------------------------|--------------------|-----------|-----------|-----------|-----------|
| | | Per cent. | Per cent. | Per cent. | Per cent. |
| Minnesota..... | 223 | 13.60 | 82.81 | 1.24 | 2.3 |
| Iowa..... | 131 | 14.24 | 82.11 | 1.12 | 2.5 |
| Wisconsin..... | 117 | 13.77 | 82.48 | 1.14 | 2.6 |
| California..... | 95 | 14.19 | 82.12 | 1.65 | 2.6 |
| Pennsylvania..... | 37 | 13.53 | 82.81 | 1.69 | 2.6 |
| North Dakota..... | 17 | 13.63 | 82.40 | 1.15 | 2.8 |
| Texas..... | 15 | 13.98 | 82.76 | 1.11 | 2.1 |
| Michigan..... | 10 | 14.44 | 80.99 | 1.26 | 3.3 |
| Made and packed for U. S. Navy..... | 34 | 12.21 | 84.13 | 0.94 | 2.7 |
| Average of all samples..... | 695 | 13.90 | 82.41 | 1.18 | 2.5 |

A study of Idaho butter with suggestions for improvement, G. E. FREWER (*Idaho Sta. Bul. 73, pp. 52, figs. 11*).—This bulletin points out the prominent defects in Idaho butter, and suggests ways for their prevention.

Analyses and scores of 49 samples of ranch butter and 50 samples of creamery butter are given. The average score of the ranch butter was 86.6 per cent and for the creamery butter 91.1 per cent.

In studying the relationship between composition and score of the ranch butter it was found that low acidity, high salt content, and low casein content accompanied high scores, but no correlation was found between moisture content and score. These correlations were also observed in the creamery butter, except that between casein content and score. Moisture content and percentage of salt seemed to be closely related.

A study of the shrinkage of butter in prints is reported. With prints under stored conditions, placed 2 in. apart to allow circulation of air, the average shrinkage of butter in 1 week was as follows: Creamery, 1-lb. prints, 0.23 oz.; ranch, 1-lb. prints, 0.25 oz.; ranch 2-lb. prints, 0.27 oz. Brief notes are given on difficult churnings, controlling moisture in butter, and selling cream r. butter making on the ranch.

The manufacture of butter for storage, L. A. ROGERS, S. C. THOMPSON, and J. R. KEITHLEY (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 148, pp. 27, figs. 5*).—This is a study of 3 seasons' storage of butter made and packed for the United States Navy and 2 seasons' work with other butter manufactured under commercial conditions, to test thoroughly the effect of storage at various temperatures upon the keeping and commercial qualities of butter made by different methods.

The scores made by various samples of butter stored for 40 days at 0° F., 150 days at 0°, and 150 days at 20°, respectively, ranged with two exceptions above 90 for the butter made from cream with an acidity below 0.3 per cent, while those from cream of customary acidity were variable and usually below 90, this being especially true of the samples stored at 20°.

For several years the Navy Department has procured and stored its year's supply of butter during the period of heavy production. The butter has been made from pasteurized sweet cream, packed in hermetically sealed cans under the supervision and specifications of the Dairy Division of this Department, and held at zero or lower. The average yearly scores before and after storage of all Navy butter for 3 years were as follows: In 1909, 94.92 and 90.90; in 1910, 94.73 and 91.75; and in 1911, 94.75 and 92.37. In one creamery, which was allowed to disregard the acidity and pasteurization requirements of the specifications, butter churned from cream with an acidity of about 0.56 per cent scored originally 94.20 and after 8 months' storage 87.25, 90.7 per cent of all samples showing a pronounced fishy flavor. As compared with this, butter from a creamery which used pasteurized sweet cream had an original score of 94.69 and after 8 months' storage 92.33.

Under the direction of the Dairy Division creamery butter was made in Minnesota in 1910 and 1911 expressly for storage. In 1910 the butter was packed in June and early July, and removed from storage the next February. In 1911 the butter was packed in May and early June and removed from storage the next January. The following table gives the number of churnings and average scores before and after storage:

Average scores of creamery butter before and after storage.

| Kind of butter. | Treatment of cream in 1910. | | | Treatment of cream in 1911. | | |
|---------------------|-----------------------------|-----------------------|--------------------------|-----------------------------|-----------------------|--------------------------|
| | Raw, ripened. | Pasteurized, ripened. | Pasteurized, un-ripened. | Raw, ripened. | Pasteurized, ripened. | Pasteurized, un-ripened. |
| Fresh butter..... | Score, 92.33 | Score, 93.35 | Score, 92.94 | Score, 93.55 | Score, 93.52 | Score, 94.61 |
| Stored at 0° F..... | 87.33 | 91.20 | 92.36 | 91.86 | 91.74 | 94.18 |
| Stored at 10°..... | 86.04 | 90.28 | 91.91 | 89.48 | 89.91 | 93.16 |
| Stored at 20°..... | 86.33 | 88.47 | 91.41 | 89.88 | 89.64 | 92.88 |

It is stated that the difference in scores of butter stored at zero and 10° is sufficient to warrant the use of the lower temperature even for butter of the best keeping quality. However, at 20° the deterioration of the sweet-cream butter was comparatively slight, indicating that this butter would retain its flavor well after removal from storage, and again demonstrating the superiority of butter made from pasteurized sweet cream.

A study of the gases of Emmental cheese. W. M. CLARK (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 151, pp. 32, figs. 5*).—This bulletin reports in detail the results of experimental work concerning the chemical contents of the so-called "eyes" of Swiss or Emmental cheese and discusses the cause of eye formation, a brief report of which has been previously noted (*E. S. R.*, 26, p. 775). An apparatus devised for the collection over mercury of the gas from the eyes of cheese is described and illustrated, as is also an apparatus devised for the collection of gas from "pinholes" and from the body of the cheese. Analyses are reported of gas collected from a number of Emmental cheeses by these 2 methods, and the results discussed in the light of the literature on the subject.

As a result of tests for the presence of hydrogen it is stated that hydrogen plays no rôle in the formation of normal eyes in cheese. Other experiments are given which refute the contention that, in the analysis of gas in the eyes, hydrogen escapes detection because of its rapid diffusion out through the cheese. The absence of an appreciable amount of oxygen and the presence of

large percentages of nitrogen in these analyses led to a study of the diffusion of air into cheese with absorption of oxygen. By the use of a diffusion apparatus, which is illustrated and described, and small disks of cheese taken from sound portions of freshly cut cheese, every precaution being used in cutting and handling to prevent breaking of the texture, no apparent diffusion of either air or carbon dioxide occurred during an hour. The same impermeability for air was observed during an experiment lasting several days. Further tests in which diffusion was induced by a mercury pump were made and showed remarkable impermeability of Emmental cheese and practically the same result with Cheddar cheese. It is stated that the permeability of cheese to gases is probably due to the diffusion of dissolved gases, and that as the free solvent becomes more and more attenuated the gas is more and more unable to find its way through the gel.

"The gases of normal eyes in Emmental cheese are exclusively carbon dioxide and nitrogen, and of these only the carbon dioxide is of significance. The nitrogen accompanying the carbon dioxide in normal eyes is that of air originally occluded in the curd at the time of manufacture. There sometimes occurs during the initial fermentation an evolution of gas characterized by the presence of hydrogen. This is believed to be due to the gaseous fermentation of sugar. The hydrogen from such an initial fermentation may sometimes linger to contaminate the gas of normal eyes. The 2 fermentations are distinct and are characterized by their gaseous products. The one is detrimental, the other that demanded of a good Emmental cheese. High oxygen-absorbing power combined with low permeability of the cheese to air render the interior thoroughly anaerobic, and consequently favorable to the growth of anaerobic bacteria. A comparison between the amount of carbon dioxide evolved and the total volatile fatty acids shows that the activity of the propionic bacteria of von Freudenreich and Jensen (*E. S. R.*, 18, p. 177) is not sufficient to account for all the carbon dioxide found. It was found that cheese is capable of retaining a very large amount of carbon dioxide. The possibility is suggested that there are two phases in the formation of normal eyes, a saturation of the body with carbon dioxide, and an inflation of eyes; and the bearing of this hypothesis on the production of gas by a specific cause is discussed."

The bacteriology of Cheddar cheese, F. G. HASTINGS, ALICE C. EVANS, and F. B. HART (*U. S. Dept. Agr., Bur. Anim. Indus. Bul. 150, pp. 52, pl. 1, figs. 4*).—This bulletin comprises, with slight changes, the text of Research Bulletin 25 of the Wisconsin Station, previously noted (*E. S. R.*, 27, p. 879).

VETERINARY MEDICINE.

A text-book upon the pathogenic bacteria and protozoa for students of medicine and physicians, J. McFARLAND (*Philadelphia and London, 1912, 2. ed., rev., pp. 878, pls. 3, figs. 283*).—A thoroughly revised edition of this work (*E. S. R.*, 22, p. 182), with the addition of a section on pathogenic protozoa.

Tropical medicine and hygiene, C. W. DANIELS (*London, 1912, pt. 3, pp. VII+359, pls. 2, figs. 13*).—This part of the work previously noted (*E. S. R.*, 24, p. 479) deals with diseases due to bacteria and other vegetable parasites, to dietetic errors, and of unknown causation.

Veterinarian's handbook of materia medica and therapeutics, D. H. UDALL (*Utah, N. Y., 1912, pp. 177*).—This is a small pocket guide.

Report on the operations of the veterinary sanitary service of Paris and the Department of the Seine during the years 1910 and 1911, H. MARTIN (*Rap. Opér. Serr. Vét. Sanit. Paris et Dépt. Seine, 1910, pp. 239, figs. 17; 1911*

pp. 240, figs. 17).—These are detailed reports of the work carried on during the years 1910 and 1911.

Report on the veterinary service of Saxony, 1911 (*Ber. Veterinär. Königl. Sachsen*, 56 (1911), pp. V+181).—This is the annual report dealing with the occurrence of diseases during the year, meat inspection work, etc.

Annual report of the Punjab Veterinary College and of the civil veterinary department, Punjab, for the year 1911-12, H. T. PEASE and G. K. WALKER (*Ann. Rpt. Punjab Vet. Col. and Civ. Vet. Dept., 1911-12*, pp. II+2+10+XII).—This report includes accounts of the occurrence of contagious diseases during the year, breeding operations, etc.

Annual report on the civil veterinary department, Burma, for the year ended March 31, 1912, G. H. EVANS (*Ann. Rpt. Civ. Dept. Burma, 1912*, pp. 2+15, pl. 1).—This report includes accounts of the occurrence of contagious and other diseases, preventive inoculation, breeding operations, etc.

Anthrax of animals in Panama, with a note on its probable mode of transmission by buzzards, S. T. DARLING and L. B. BATES (*Amer. Vet. Rev.*, 32 (1912), No. 1, pp. 70-75).—The authors here report the occurrence of this disease in a cow and a hog, but state that very few cases of anthrax in animals have been brought to their attention during the past 7 years. The infrequency with which anthrax has been encountered in Panama leads them to conclude that the territory from which cattle and hogs are obtained is almost entirely free from the disease. The fact that there is no importation of cattle into the Republic at the present time favors the relative immunity from the disease among herds near by.

In experiments conducted to determine the rôle of buzzards in the transmission of the infection, meat thoroughly soaked and mixed with a saline emulsion of anthrax bacilli and spores grown on agar plates was fed to 3 turkey buzzards. Numerous agar plates were immediately made of specimens taken at approximately 12, 36, 60, and 84 hours after feeding, but in none was the anthrax bacillus present. In order to introduce a maximum number of bacilli, the experiment was repeated by injecting a heavy saline emulsion of bacilli and spores into the gullet of the buzzard through a rubber catheter; agar plates were made as in the first experiment and anthrax bacilli found to be absent. The birds were killed shortly after the experiment was completed, and cultures taken from various portions of the intestinal tract showed the absence of anthrax bacilli.

The authors conclude from the investigations that pastures and other locations can not be infected by buzzards through the agency of droppings, but require more intimate contact.

Salvarsan in glanders, BLACODERELEW (*Abs. in Berlin. Tierärztl. Wechnachr.*, 28 (1912), No. 35, p. 656).—The author reports that the administration of 2.4 gm. of salvarsan to 3 horses suffering from glanders resulted in a generally improved condition in from 5 to 7 days. After 40, 47, and 54 days the ulcers on the nasal septum of 2 of the horses had healed, but the discharge had again increased and taken on a purulent character. The animals were then slaughtered, and glanderos foci were found in the lungs. The author is led to conclude that a partial destruction of the bacilli and a partial attenuation of their virulence was responsible for the apparent cure.

Researches on trichinosis, M. ROMANOVITCH (*Ann. Inst. Pasteur*, 26 (1912), No. 5, pp. 351-370, pl. 1, figs. 2).—This report of studies (E. S. R., 25, p. 587) made of the rat and guinea pig deals with the distribution of the larvæ in the infested organism, microbial infections in trichinosis, toxic action of the larvæ, and investigations of specific antibodies in the serum of infested animals.

It is stated that the course of the disease may sometimes be retarded by injections of tartar emetic. Salvarsan does not appear to exercise any action on the larvae.

Antelope as a reservoir for *Trypanosoma gambiense*, H. L. DUKE (*Proc. Roy. Soc. [London], Ser. B*, 85 (1912), No. B 579, pp. 299-311).—The author concludes "that the antelope may remain capable of infecting *Glossina palpalis* with *T. gambiense* for a period of at least 22 months after the original infection with this trypanosome; that there is some evidence to show that an antelope which has ceased to be infective for *T. gambiense* acquires some degree of immunity against reinfection."

Castor oil bean poisoning, T. PARKER (*Vet. Rec.*, 24 (1912), No. 1442, p. 699).—Crushed castor oil beans in meal fed to swine caused the loss of several animals.

The action of anthelmintics on parasites located outside of the alimentary canal, B. H. RANSOM and M. C. HALL (*U. S. Dept. Agr., Bur. Anim. Indus. Bul.* 153, pp. 23).—The authors present a historical review of the literature relating to the action of anthelmintics on parasites, particularly those located outside of the alimentary canal. Experiments conducted are then briefly reported.

Tests of the action of carbon bisulphid, a proprietary remedy, and etheral extract of male fern were made with a number of sheep. The results, while inconclusive, point to the inefficacy of carbon bisulphid, since in the one case where tapeworms (*Thysanosoma actinioideus*) were found, they were alive after 12 gm. of carbon bisulphid had been administered. The proprietary remedy, which upon analysis was found to contain 49 per cent ferrous sulphate, 13 per cent arsenious oxid, 8 per cent oxids of calcium, potassium, silicon, and magnesium, and 29 per cent organic matter (the nature of which was not determined but did not contain santonin or any other vegetable alkaloid) appeared to be practically inert as a vermifuge and any improvement following its use must be attributable to the tonics contained in it. The extract of male fern, which was administered on 4 successive days to 4 sheep in doses of 6 cc. mixed with 25 cc. of linseed oil, was not efficacious against *thysanosomiasis*.

The authors find that the present state of our knowledge does not warrant any conclusion other than that a great amount of additional work is necessary and desirable. A bibliography is appended.

Experimental studies on the administration of salvarsan by mouth to animals and man, J. A. KOELMER and J. F. SCHAMBERG (*Jour. Expt. Med.*, 15 (1912), No. 5, pp. 498-509, pl. 1).—"Salvarsan can be administered in pills, in capsules, and in solution to lower animals in dosage of 0.02 to 0.03 gm. per kilogram of body weight, without producing toxic symptoms. A dog received 0.57 gm. of salvarsan in pill and capsule form in the course of 20 days without any disturbing effects. After the oral administration of salvarsan, arsenic is found in the bile and urine at the end of 24 hours, but it disappears by the end of 72 hours. Twenty-four hours after the oral administration of salvarsan to rats, the number of bacteria in the intestinal tract appears to be reduced, the reduction being most striking in the lower end of the ileum.

"Salvarsan administered by mouth and likewise intravenously to rabbits in doses approximating those employed in human subjects does not produce, at least within 96 hours following its administration, any appreciable microscopic changes in the important viscera."

Note on a further experiment carried out to ascertain the effect of the ingestion of ergot by cattle, C. J. REAKES and H. A. REID (*New Zeal. Dept. Agr.*, 5 (1912), No. 2, pp. 99-101, figs. 2).—The results of a further experiment (E. S. R., 26, p. 586) on the toxic effect of ergot on cattle led the

authors to the following conclusions: That poisoning by ingestion of ergotized rye can and does take place; that the lesions following consist of dry gangrene of the extremities of the limbs; that when suppuration is present it is the result of germ infection by the *Bacillus necrophorus* aided by the presence of the casually occurring *Staphylococcus pyogenes*; that no definite inference could be drawn through failure to produce typical symptoms when utilizing dietal preparations of ergot, or old samples of it; that what may be termed a basic train of symptoms may not necessarily follow; and that a varying degree of insusceptibility to ergot poisoning is possessed by certain individual animals.

The normal clinical urinalysis of the dairy cow. D. J. HEALY (*Amer. Vet. Rec.*, 42 (1912), No. 2, pp. 184-191).—The author finds the urine of normal dairy cows to be approximately as follows: "Color, yellow; specific gravity, 1.014; reaction, alkaline; a slight flocculent precipitate, and occasionally a easy white precipitate of calcium sulphate; urea, 1.06 per cent; hippuric acid, .17 per cent; ammonia, a trace; total nitrogen, 0.58 per cent; no albumin; no sugar. Microscopical examination: Squamous epithelial cells; irregular and spiral vegetable cells; starch granules; calcium sulphate crystals; and amorphous matter."

The samples used in the work were obtained, once during the 24 hours, from the registered Jersey cows which form the Kentucky Station dairy herd. With the exception of 4 samples, they were obtained during the period of evening milking, between the hours of 4 and 6 o'clock.

The ox warble, its evolution, injury, and means for combating it. A. MARINX (*Rev. Vet. [Toulouse]*, 37 (1912), Nos. 8, pp. 457-469, pls. 2, figs. 1; 9, pp. 474-479).—A summarized account.

On a nematode in the connective tissue of bovines. M. PIETTRE (*Hyg. Viande et Lait*, 6 (1912), Nos. 9, pp. 473-488; 10, pp. 537-552, figs. 9).—This is a more detailed report of the investigation previously noted from another source (*E. S. R.*, 27, p. 83).

Some further researches on Johne's disease. F. W. TWORT and G. L. Y. INGRAM (*Vet. Jour.*, 68 (1912), No. 448, pp. 569-572).—This is a continuation of the investigation previously noted (*E. S. R.*, 26, p. 783).

A diagnostic reagent which is specific for Johne's disease has been prepared from a 9-months-old culture of Johne's bacillus grown on ordinary glycerin peptone beef broth containing glycerin saline extract of *Bacillus phibi*. This reagent when injected subcutaneously into an animal suffering from the disease causes a rise in temperature of from $4\frac{1}{2}$ to $5\frac{1}{4}$ ° F., but has no effect on a healthy animal. "The disease being thus demonstrable to an owner in its earliest stages, on the use of such a vaccine as is here described becoming general, state legislation should be adopted, making slaughter compulsory. No compensation would be called for, the carcass of an affected animal being salable, and it being to the interest of the owner to remove a source of infection from his herd."

After repeated subculturing and after maintaining life about 18 months outside the animal body, the authors succeeded in inducing Johne's bacillus to grow on ordinary glycerin liver broth. Two young goats that were inoculated, one intravenously and one intraperitoneally, with living cultures of Johne's bacillus developed the disease. The authors consider it probable that the condition demonstrated in deer by McFadyen in 1907 and by Stockman in sheep in 1909 is caused by the same bacillus that affects bovines.

Further notes on Johne's disease in cattle. J. T. ANGLIN (*Vet. Rec.*, 24 (1912), No. 1247, pp. 754-758, pl. 1).—A summarized account with reports of several cases.

Johne's disease, J. M'ADYEAN, A. L. SHEATHER, and J. T. EDWARDS (*Jour. Compar. Path. and Ther.*, 25 (1912), No. 3, pp. 217-275, pl. 1, figs. 35).—The authors first present records of examinations of 19 natural cases of Johne's disease. The cultural characters of the bacilli are then dealt with, followed by an account of the morphology and staining characteristics of the organism.

Do different species of Piroplasma occur in cattle in Germany? P. KNUTH (*Berlin. Tierärztl. Wehnschr.*, 28 (1912), No. 17, pp. 295-298, figs. 3).—This is a discussion of the occurrence of 2 species of Piroplasma (*bigeminum*, *diversus*) in cattle in England, the probable occurrence of both in cattle in Germany, and the rôle of *Ixodes ricinus* and *Hemaphysalis punctata* in their transmission.

The treatment of rinderpest and hemorrhagic septicemia with permanganate of potash, G. K. WALKER (*Jour. Compar. Path. and Ther.*, 25 (1912), No. 3, pp. 185-202).—Thirty animals suffering from rinderpest were given permanganate of potash by mouth in doses varying from $\frac{1}{4}$ to 2 dr. dissolved in from 3 to 5 pt. of cold water to which 1 or 2 oz. of vinegar had been added. Several 1 or 2 dr. doses were also administered later on. Three of the cases treated and 7 of the 13 controls died.

Permanganate of potash, $\frac{1}{4}$ to 3 dr., was also administered to 23 cases of hemorrhagic septicemia, of which 10 recovered. Of the cattle 83.3 per cent recovered, while of the buffaloes, which are more susceptible to this disease, but 29.4 per cent recovered.

Interim report re the dosing of sheep with Cooper's dip and bluestone under the conditions of a sour veld farm, A. THEILER (*Agr. Jour. Union So. Africa*, 4 (1912), No. 2, pp. 161-171).—The author has repeated the experiments relating to the dosing of sheep, previously noted (*E. S. R.*, 27, p. 683), with a view to determining the maximum dose for sheep and lambs. The results have been summarized as follows:

"The maximal safe dose for sheep of 4 to 8 tooth under the conditions of the sour veld in Stutterheim District was found to be 15 grains of Cooper's dip and 15 grains of bluestone. The maximal safe dose for sheep of 2-tooth under the same conditions proved to be 10 grains of Cooper's dip and 10 grains of bluestone. The maximal safe dose for lambs between 5 and 9 months old under the same conditions proved to be $7\frac{1}{2}$ grains of each. Smaller doses than the maximal ones proved to be equally effective on the wireworms as the maximal safe dose. (This, however, requires further investigation on a much larger number of sheep and lambs.) The mixture of Cooper's dip and bluestone, even in the maximal doses, does not expel all worms, although it reduces their number."

Hog cholera—Demonstration of a filterable virus as the cause of the disease in Portugal, A. BETTENCOURT (*Bul. Soc. Portugaise Sci. Nat.*, 5 (1911), No. 2, pp. 50-53).—This paper reports the preliminary results of the work of the commission appointed to study swine diseases in Portugal.

Directions for vaccinating against hog cholera, F. B. HADLEY (*Wisconsin Sta. Circ. Inform.*, 39, pp. 11, figs. 6).—This circular discusses the symptoms of hog cholera, manner of preparing the antiserum, and details relating to vaccination.

Navel-ill in new born foals, W. J. TAYLOR (*Montana Sta. Circ.*, 11, pp. 39-41).—A brief popular account of this disease.

Death of mules due to parasites, H. BRADLEY (*Amer. Vet. Rev.*, 42 (1912), No. 2, pp. 217, 218).—This is a report of cases in which death was caused by the parasites *Sclerostomum tetracanthum* and *S. equinum*, or *Strongylus armatus*, the first mentioned being present in much greater numbers. These parasites were numerous in the cecum and colon, but none could be found in the blood vessels.

Report on an outbreak of canine piroplasmosis due to *Piroplasma gibsoni* among the hounds of the Madras Hunt, together with some observations on the treatment of the disease with salvarsan, T. H. SYMONS and W. S. PATERSON (*Ann. Trop. Med. and Par.*, 6 (1912), No. 3, pp. 361-370, figs. 6).—Rapid recovery followed the administration intramuscularly of 0.6 gm. of salvarsan to hounds suffering from piroplasmosis due to *P. gibsoni*. This disease appears to be transmitted from the jackal (*Canis aureus*) to hounds by an undescribed species of *Rhipicephalus*.

A species of *Trichosomum* in the turkey (*Meleagris gallopavo domestica*). C. BARILE (*Bul. Soc. Zool. France*, 37 (1912), No. 3, pp. 126-133, figs. 3).—The name *Trichosomum meleagris gallopavo* is given to a new species of nematode which caused fatal lesions in the intestine of a turkey at Turin, Italy.

RURAL ENGINEERING.

Seepage and return waters, L. G. CARPENTER (*Colorado Sta. Bul.* 180, pt. 2, pp. 3-47).—This portion of this bulletin contains tables giving detailed seepage measurements, showing the absolute amount of seepage gain from year to year in the Cache la Poudre River for a period of some 25 years, and also the progressive changes due to the development of irrigation during this period. The measurements made up to 1896 have been previously noted (E. S. R., 7, p. 808). It is announced that comments and conclusions from the measurements are to be given in part 1 of this bulletin, which has not yet been issued.

The conveyance of irrigation water: Practice in British Columbia (*Engin. and Contract.*, 38 (1912), Nos. 10, pp. 273, 275; 11, pp. 306-308, figs. 3; 12, pp. 328-331).—This article deals with seepage losses in canals, canal linings to prevent seepage losses, steel flumes, and plain and reinforced concrete pipe. It is stated that wooden flumes are more economical in the long run than wooden pipe systems; that concrete lining for canals is on the whole more satisfactory in preventing seepage losses than oil, clay-puddle, thin cement mortar, or wood; and that concrete pipe is more durable and economical than wood or iron pipe up to a pressure head of about 150 ft.

Why irrigating water should be measured, R. R. LYMAN (*Engin. News*, 68 (1912), No. 16, pp. 722, 723).—The author states that on every irrigated farm records should be kept of the amount of water used, the time of application, and the crop results, thus showing the amount which makes a good crop, and the surplus which waterlogs and ruins the land. He further points out the importance of having an expert irrigation engineer in charge of the measurement and distribution of irrigation water to prevent waste of water and waterlogging.

The use of small pumping plants for irrigation in British Columbia (*Engin. and Contract.*, 38 (1912), No. 14, pp. 389-392).—This article deals in a comprehensive manner with the selection, installation, efficiency, and cost of small pumping plants as applied to irrigation in British Columbia.

The required capacity of the plant depends on the area irrigated, the water duty, and the period of operation. It has been found desirable to operate the pumping plant only one-third to one-half of the time during the irrigation season, since continuous operation means loss of time, poorly distributed water, uneconomical irrigation, and loss of efficiency in the plant. This requires a plant 2 or 3 times the size of that required for continuous irrigation, and for the smallest orchard a stream of at least 65 gal. per minute is desirable.

In a comparison of centrifugal pumps and power plunger pumps it is stated that plunger pumps are best adapted to high heads above 75 ft. and small

or moderate volumes of water under 200 gal. per minute; while centrifugal pumps are best adapted to lifts below 75 ft. and high volumes above 200 gal. per minute. Efficiencies of from 30 to 55 per cent are given for entire centrifugal pumping plants, varying with the type of pump, connection with power, and the speed; and efficiencies of from 30 to 78 per cent are given for plunger pumps alone, varying uniformly with the size of the pump and the lift. The power required to operate pumps is computed on the basis that 1 horsepower is equivalent to 3,300 gal. per minute raised 1 ft. As economical limits for pumping it is stated that for small plants it is not well to exceed lifts of 200 ft., while for large plants lifts of 400 ft. may be economical.

[An irrigation pumping plant with three lifts], G. T. INGERSOLL (*Engin. and Contract.*, 38 (1912), No. 11, pp. 385-389, figs. 5).—This presents the details of an electrically driven pumping plant for irrigation, equipped with 8 centrifugal pumps operating in 3 groups under 3 different lifts of 50, 85, and 108 ft. and delivering 34,400 gal. per minute.

The cost and methods of clearing land in western Washington, H. THOMSON (*Washington Sta. Bul. S. spec. ser.*, pp. 3-34).—The material contained in this bulletin has been previously noted as Bulletin 233 of the Bureau of Plant Industry of this Department (E. S. R., 27, p. 189).

A text-book on roads and pavements, F. P. SPALDING (*New York and London, 1912, 4, ed., rev. and enl.*, pp. XI+498, figs. 51).—This book gives a brief discussion from an engineering standpoint of the principles involved in highway work and outlines the more important systems of construction, giving considerable space to the location and construction of country roads for the special benefit of the rural engineer. It contains chapters on road economies and management; street and road drainage; location, improvement, and maintenance of country roads; broken-stone and bituminous macadam roads; foundations for pavements; brick, asphalt, wood-block, stone-block, and concrete pavements; and city streets.

Farm gas engines, H. R. BRATE (*Cincinnati, 1912, pp. 195, figs. 36*).—This book describes in a comprehensive and general way the actions of the parts necessary to the successful running of a gas engine, giving examples of various troubles found in its operation, with remedies, and paying special attention to the subjects of carburetion, ignition, compression, cooling, and lubrication. In addition it contains chapters on the 2 and 4 cycle types, fuels, gas tractors and portable outfits, pumping plants, electric-lighting plants, farm machinery operated by gas engines, and marine engines.

[Motor plow and cultivator] (*Impl. and Mach. Rev.*, 38 (1912), No. 459, pp. 791, 792, figs. 3).—Descriptions are given of a small motor plow and motor cultivator, both of which are intended for use where space is limited, as around fruit trees and in small market gardens.

The plow has a wrought-iron framework and road wheels 2 ft. in diameter, with 7 in. rims, driven by a 4-horsepower water-cooled gasoline engine. The transmission is obtained through a chain to a shaft with a friction clutch controlled from the plow handles, thence by iron spur gearing to the road wheels. The whole weighs 650 lbs. It is claimed that 1 acre of land can be turned with $3\frac{1}{2}$ gal. of gasoline.

The cultivator is driven by a 2-horsepower fan-cooled engine and the framework is arranged to accommodate any standard cultivator tool. This machine is also fitted to carry and operate a spraying machine. In both machines the speed may be adjusted to suit the operator and the reaction of the engine tends to keep the tools to their correct depth in the ground.

Traction resistance of plows, M. RINGELMANN (*Jour. Agr. Prat.*, n. ser., 24 (1911), No. 36, pp. 393-395).—The author discusses the traction resistance of plows in various soils, and shows that it varies with the construction, weight, and stability of the plowing machine, the speed of the operation, and the nature and condition of the soil.

Adjusting the seed drill, H. B. BONEBRIGHT (*Montana Sta. Circ.* 15, pp. 199-192, fig. 1).—To adjust a drill to sow a given amount of seed per acre the following procedure may be used: Divide the number of square feet in an acre by the effective width of the drill in feet, and divide this result by the circumference of the drive wheel, thus obtaining the number of revolutions which the wheel will make in sowing an acre. Jack up one end of the drill, and after filling the box with the grain which is to be sown turn the wheel enough times to sow $\frac{1}{4}$ or $\frac{1}{2}$ acre. Catch this grain on a canvas and weigh. Readjust the drill and repeat until the correct amount of grain is let down.

Oil-mixed Portland cement concrete, L. W. PAGE (*U. S. Dept. Agr., Office Pub. Roads Bul.* 46, pp. 28, pls. 5, figs. 7).—This bulletin describes a simple method devised by the author for damp-proofing concrete by the incorporation of mineral oil residuum with the ordinary concrete mixture, gives the results of physical tests, and describes the application of oil-mixed Portland cement concrete to such structures as basement floors, cellar walls, watering troughs and tanks, cisterns, barns, building blocks, roofs, and other engineering constructions.

Where damp-proofing is required 5 per cent of petroleum residuum oil, based on the weight of cement in the mixture, is all that is necessary. In hand mixing, the sand, cement, and water are first mixed to a mushy consistency, the oil then added and mixed until no trace of it is visible on the mortar surface, and the stone or gravel then mixed in. In machine mixing, the sand, cement, and water are first mixed to a mortar, when alternate batches of oil and stone are added and mixed.

The following conclusions are drawn from the results of physical tests of oil-mixed Portland cement concretes: "(1) The tensile strength of 1:3 oil-mixed mortar is very little different from that of plain mortar, and shows a substantial gain in strength at 28 days and 6 months over that at 7 days. (2) The times of initial and final set are delayed by the addition of oil; 5 per cent of oil increases the time of initial set by 50 per cent and the time of final set by 47 per cent. (3) The crushing strength of mortar and concrete is decreased by the addition of oil to the mix. Concrete with 10 per cent of oil has 75 per cent of the strength of plain concrete at 28 days. At the age of 1 year the crushing strength of 1:3 mortar suffers but little with the addition of oil in amounts up to 10 per cent. (4) The toughness or resistance to impact is but slightly affected by the addition of oil in amounts up to about 10 per cent. (5) The stiffness of oil-mixed concrete appears to be but little different from that of plain concrete. (6) Elasticity.—Results of tests for permanent deformation indicate that no definite law is followed by oil-mixed concrete. (7) Absorption.—Oil-mixed mortar and concrete containing 10 per cent of oil have very little absorption and under low pressures both are waterproof. (8) Permeability.—Oil-mixed mortar containing 10 per cent of oil is absolutely water-tight under pressures as high as 40 lbs. per square inch. Tests indicate that oil-mixed mortar is effective as a waterproofing agent under low pressures when plastered on either side of porous concrete. (9) The bond tests show the inadvisability of using plain bar reinforcement with oil-concrete mixtures. The bond of deformed bars is not seriously weakened by the addition of oil in amounts up to 10 per cent."

The action of alkali on hydraulic cements, E. BUSKE and R. M. PINCKNEY (*Montana Sta. Circ.* 8, pp. 35-49, figs. 3).—This circular is a popular edition of Bulletin 81, previously noted (E. S. R., 25, p. 490), but containing data on additional waterprooferers for cement.

The economical design of reinforced concrete beams, R. B. KETCHUM (*Utah Engin. Expt. Sta. Bul.* 4, 1912, pp. 78, figs. 9).—This bulletin gives a mathematical discussion of the design of reinforced concrete beams and slabs, with tables and diagrams intended to simplify the application of the accepted theories on the subject.

Types of stables, M. RINGELMANN (*Jour. Agr. Prat., n. ser.*, 24 (1912), No. 48, pp. 369-372, figs. 5).—The author describes different arrangements and dimensions of stalls and mangers to suit average-sized animals and to facilitate the work of feeding and stable cleaning, and discusses the barn-frame construction from the standpoint of general sanitation for the animals and economy of space and material.

Cow sheds (*Jour. New Zeal. Dept. Agr.*, 5 (1912), No. 2, pp. 145-147, figs. 4).—Detailed working plans for open-front cow sheds, giving the quantities of timber, roofing, iron, and concrete necessary, are presented.

Poultry houses, W. F. SCHORPE (*Montana Sta. Circ.* 9, pp. 15, figs. 6).—This publication gives notes on the location of poultry houses, so that drainage, sunlight, and protection from the weather may be obtained, and on ventilation and general sanitation, and describes and outlines the details of construction of the curtain-front poultry house, previously noted (E. S. R., 21, p. 274).

Sewage disposal for rural homes, C. A. OCOCK and W. H. WRIGHT (*Wisconsin Sta. Circ. Inform.* 34, pp. 15, figs. 10).—This publication discusses the theory of sewage purification by bacterial action and outlines a system of sewage purification and disposal, consisting essentially of purification, sedimentation, and liquefaction in a septic tank, and final purification and disposal by means of distribution through an absorption system of open-jointed drain tile set in sandy or porous soil.

The design, construction, and operation of single and double chamber septic tanks and their corresponding absorption systems are outlined, the single tank discharging by means of a hand-operated valve plug and the double tank by an automatic siphon. Since the single tank destroys its film or scum at every discharge it should be used only for small families and should have one-fourth to one-third more absorbing tile. The tanks should be of sufficient capacity to hold from 1 to 3 days' sewage and from 1 to 2 ft. of tile should be provided for every gallon of sewage discharged, according to the porosity of the soil. A grease trap to separate the grease and sewage from the kitchen and dairy room is described, consisting of 2 large glazed sewer tile with the outlet to the septic tank so arranged as to prevent the escape of the grease. The total cost of a single tank and absorption system under average conditions is given as \$62.05, and of a double tank system \$69.00.

The use of a septic tank in farm sewage disposal, W. C. DAVIDSON (*Hoard's Dairymen*, 44 (1912), No. 12, pp. 331, 332, figs. 3).—This article outlines the design, location, and construction of a farm sewage disposal system of sufficient size to meet average conditions. It is estimated that the septic tank should have an average capacity of 50 gal. per capita per day, which means that the siphon chamber should discharge every 24 hours with the required capacity, and the settling chamber be of about twice this capacity for good bacterial action. For disposal after discharge the method is suggested of distributing the sewage through a system of open-jointed drain tile laid in sandy or porous soil, allowing about 75 ft. of 3 in. or 4 in. drain tile for every 50 gal. of sewage discharged.

RURAL ECONOMICS.

Supply of farm labor, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 94, pp. 81*).—This bulletin presents the results of an examination of the farm labor situation in the United States in respect to the supply of such labor, together with a comprehensive treatment of the various phases of the subject as related to the number of persons in agricultural occupations, agricultural laborers, farm wages, price of farm products, etc.

It is reported that of all persons 10 years old and over employed in gainful occupations, 83.1 per cent were employed in agriculture in 1820; 77.5 per cent in 1840; 47.3 per cent in 1870; 44.1 per cent in 1880; 37.2 per cent in 1890; and 35.3 per cent in 1900. The absolute number of persons, however, has increased from 2,068,958 in 1820 to 10,249,651 in 1910.

In 1910 the Division of Information of the Bureau of Immigration found employment for 2,761 persons in agriculture, this being 64 per cent of all persons for whom employment was found. The New York farm employment office the same year succeeded in placing with farmers 4,576 single farm hands and 122 families.

The average value of implements and machinery per farm as reported was \$101 in 1880, \$108 in 1890, \$131 in 1900, and \$139 in 1910. The average value per farm worker was \$122 in 1880, \$165 in 1890, and \$170 in 1900.

The results of a special inquiry indicate that 42.7 per cent of the male farm laborers of the United States are competent to become farm tenants, and that it is reasonably possible for such laborers or farm tenants to acquire farms large enough to support themselves and families.

Other data are given showing the relative importance in the various geographic divisions, as regards the number of agricultural laborers, of sex, color, and place of birth; agricultural colonies; effect of near-by cities on farm wage rates; relation of wages to the product; comparison of average wage rates of outdoor labor of men on farms, with industrial, urban, and productive conditions; movement of prices of farm products; productivity of labor and relative importance of farms of specified acreages; percentage of farms classified according to the total of improved and unimproved acreage; and ratio of agricultural workers to improve area of farms, 1880-1900; hand and machine labor contrasted; intensive agriculture as a source of wages; and quality of labor required.

As regards the future supply of farm labor, the author points out that "the farmer would not need to get his labor from the cities if he could hold the country population to the soil," and emphasizes the efforts now being made to secure the retention of children upon the farm.

Wages of farm labor, G. K. HOLMES (*U. S. Dept. Agr., Bur. Statis. Bul. 99, pp. 72, fig. 1*).—This bulletin presents the results of the investigations in 1909 of the wage rates of farm labor in the United States, showing by notes and tables the wage rate paid to men and women on farms by the day, month, and year in various States, geographic divisions, and for the United States as a whole at stated periods of time, and discusses extras received by laborers, the purchasing power of money wages, the influence of near-by cities on farm labor, wages, etc., and domestic labor of women on farms, alleged high insanity of farm women, etc.

The summary of average wage rates for the United States shows that the wages paid in 1909 for outdoor labor of men on farms, with board, were higher than in any of the other years covered by the series of investigations. "In 1909 monthly wages paid in hiring by the year exceeded the average for 1866 by 78.9

per cent and the average for 1890 by 35.8 per cent, while in contracts by the season monthly wages in 1909 were 63.9 above those of 1866. The combined averages for yearly and seasonal contracts in 1909 exceeded those of 1892 by 48.4 per cent and showed a gain of 44 per cent over 1899. The daily wages of harvest hands in 1909 exceeded the averages for 1866, 1890, and 1899 by 37.5, 32.4, and 39 per cent, respectively, while the corresponding increases of daily wages paid to farm hands for other work than harvesting were, respectively, 60.9, 43.1, and 37.3 per cent. For every dollar earned, on an average, by a farm laborer in 1866, under contracts which included board, from \$1.30 to \$1.79 was earned in 1909."

Cost of agricultural labor, E. GÓMEZ GARZA (*Estac. Agr. Expt. Ciudad Juárez, Chihuahua, Bol. 36, 1912, pp. 85*).—This bulletin presents the results of a special inquiry as to the cost of agricultural labor in Mexico, together with a discussion of the factors entering into the cost of agricultural production, giving special attention to capital, labor, land, transportation, use of machinery, social conditions, and the farmer as an individual. The inefficiency of Mexican labor as compared with American labor is said to be due to the fact that the former is not as well fed nor as well educated, with fewer wants to satisfy and consequently less incentive to work.

What cooperation has done for tobacco growers, J. W. GRIFFIN (*Farmers' Rev., 44 (1912), No. 27, p. 63, figs. 2*).—This article points out some peculiar advantages of agricultural cooperation to the tobacco grower, by showing what has been accomplished by the Burley Tobacco Society of Kentucky, organized for the purpose of receiving, handling, warehousing, inspecting, grading, financing, and selling all tobaccos grown by the members of the society. It is noted that farmers' loose leaf sales houses have been built in the principal towns and cities of the burley tobacco districts, where farmers carry their tobacco and dispose of it directly to buyers who use the various grades. The sales of the entire season in some of the markets are reported to have averaged more than \$10 per 100 lbs. while "before the organization of this society the same tobaccos would not have averaged more than \$3.50 or \$4 per 100 lbs."

Democracy by means of economic science, R. B. BRINSMADE (*Bol. Dir. Gen. Agr. [Mexico], Rev. Econ. Rural y Soc., 1 (1911), No. 8, pp. 631-698*).—The author here discusses in a general way the relation existing between democracy and the production and distribution of wealth as related to agriculture, with special application to conditions in Mexico. He maintains that the ideal democracy in economics is the equality of opportunity in production and equitable distribution, noting that equal and equitable distribution are separate and distinct principles. Among a number of related subjects dealt with in connection with the discussion as they relate to agriculture may be noted the single-tax theory, particular monopolies, the relation and economic effect of small and large farms, systems of land purchase, value and significance of different classes of land, tax on land grants and other landed property, increase in agricultural production, high cost of living, agricultural wages, effect of tariffs on agriculture, agricultural education, immigration, etc.

Economic science and statistics, H. H. CUNYNGHAME (*Nature [London], 90 (1912), No. 2239, pp. 116-118, figs. 8*).—An address before the British Association at Dundee, in which the author presents a number of illustrations to show that economics is a distinct and well-defined science capable of being demonstrated by means of geometry and mathematics. He gives diagrams which show by the use of curves a sympathetic relation between the price of wheat, coal, etc., the average of money wages, and the number of marriages per head of population; how the absolute cost of growing corn increases in proportion

to the quantity produced; the total cost of growing corn; the surplus profit obtained from the use of better land; and the total benefit the consumer derives from the corn expressed in terms of money.

Systems of cultivation and their relation to rural economics in Spain. G. FERNÁNDEZ DE LA ROSA (*Bol. Agr. Téc. y Econ.*, 4 (1912), Nos. 41, pp. 470-481; 42, pp. 532-543; 43, pp. 630-641; 44, pp. 726-737; 45, pp. 828-839).—This is a continued article discussing in detail economic significance of systems of agriculture as practiced in Spain; crop diversification and the advantages attending the conservation and protection of forests; the main causes for the increase of uncultivated lands; the relation between cereal and pastoral lands and the proportion they bear to the various systems of agriculture; and systems of cultivation, giving special attention to a number of leading crops; together with some observations relative to irrigation and fertilization as factors in intensive agriculture.

Sugar at a glance. T. G. PALMER (*U. S. Senate, 62. Cong., 2. Sess., Doc. 890, 1912, pp. 68, figs. 56*).—This document discusses the growth of the beet-sugar industry in the United States and foreign countries, with the idea of showing how national economy and the cost of living are affected to an extent by the increased yield of other crops when grown in rotation with sugar beets. A number of charts are given illustrating the effect of import duties upon the development and progress of the industry.

[Farm product statistics] (*Bur. of the Census [U. S.] Bul. 13, pp. 35-39*).—Data regarding the quantity and value of materials, products, etc., of a number of important industries manufacturing farm produce in the United States are here presented.

* The total cost of materials, viz. milk, cream, sugar, etc., in the butter, cheese, and condensed-milk industry is reported at \$108,841,200 in 1899 as compared with \$235,546,064 in 1909, while the total value of the products was \$130,783,349 in 1899 and \$274,557,718 in 1909. The increase in price of the factory products has also been quite pronounced, as shown by the fact that the butter product increased 113.5 per cent in value and only 48.7 per cent in quantity; and the output of cheese 63 per cent in value and only 10.3 per cent in quantity.

The total quantity of all kinds of grain milled in 1909 as reported was 806,247,961 bu., or 10.6 per cent more than in 1899; the increase in the value of all products of flour mills and grist mills for the same period being 76.2 per cent. The value of wheat flour produced increased 64.7 per cent, but its quantity only 6 per cent; while the production of rye flour increased 54 per cent in value and only 6.2 per cent in quantity. The increase in quantity of pork as reported by the slaughtering and meat-packing industry was 16,421,398 lbs., or less than 1 per cent, while the value of the product increased \$166,376,042, or 51.9 per cent. The quantity of lard increased 223,785,765 lbs., or 21.9 per cent, while its value increased \$73,256,353, or 119.8 per cent.

Corresponding data are given for a number of other farm products.

Imports of farm and forest products, 1909-1911, by countries from which consigned (*U. S. Dept. Agr., Bur. Statis. Bul. 95, pp. 83*).—This report is a continuation of a series of bulletins showing for stated periods the quantity, value, etc., of imports of farm and forest products into the United States by grand divisions and countries from which consigned (*E. S. R.*, 26, p. 294).

The value of farm products imported into the United States during the year ended June 30, 1911, amounted to \$680,204,922, as compared with \$687,509,115 the previous year, and these imports formed 44.5 per cent of all imports. The value of imports of forest products in 1911 amounted to \$162,311,565, as compared with \$178,871,797 in 1910, the decrease being largely in India rubber.

Exports of farm and forest products, 1908-1911, by countries to which consigned (*U. S. Dept. Agr., Bur. Statist. Bul. 96, pp. 109*).—This is a continuation of a series of bulletins (*E. S. R.*, 26, p. 294), presenting a compilation of statistics as to the exports of farm and forest products of the United States for the year ended June 30, 1911.

The total value of domestic farm products exported in 1911 is placed at \$1,630,794,492, or nearly \$100,000,000 more than last year, and of forest products at \$103,038,892, as compared with \$85,000,230 in 1910. The balance of trade in them was \$265,254,018 in favor of the United States in 1911, as compared with \$198,118,937 in 1910 and \$274,219,152 in 1909. About 40 per cent of the consignments of domestic farm products was sent to the United Kingdom; 26 per cent to Germany; and the remaining 40 per cent to 89 different countries.

Crop Reporter (*U. S. Dept. Agr., Bur. Statist. Crop Reporter, 14 (1912), No. 10, pp. 73-80, figs. 3*).—Notes and statistics are given showing the condition of the cotton crop, September 25, 1912, to be 63.6 per cent as compared with 71.1 per cent at the same time last year. Other data are given showing the condition of other crops October 1, 1912, with comparisons; production of wheat in specified countries, 1912-1910; sugar production of Porto Rico, 1908-1911; apparent balance of trade of the United States for the year ended June 30, 1912; farm value of important products on dates indicated; a report on cotton ginning; data as to the estimated production of wheat in the Northern Hemisphere, of rye in 15 countries, of barley in 19 countries, of oats in 19 countries, and of corn in 19 countries; the farm value of important crops and products; together with tables showing exports of farm and forest products; Philippine sugar; cotton consumption and supply; monthly receipts and stocks of butter and eggs; and range of prices of agricultural products at important markets.

AGRICULTURAL EDUCATION.

Relation of agricultural college to other institutions (*Farmer's Advocate, 47 (1912), Nos. 1032, pp. 962, 963, 980, figs. 3; 1033, pp. 1028, 1029*).—This is a symposium by presidents, directors, and deans of agricultural colleges and directors of experiment stations in Canada and this country on the ideal relationship between the agricultural college and institutions at which other branches of learning receive attention.

Theoretical-practical school of agriculture [in Brazil] (*Rev. Vet. e Zootech., 2 (1912), No. 2, pp. 120-135, pls. 1*).—This is an account of the object, equipment, and curriculum of the school of agriculture recently established in connection with the zootechnical station at Pinheiro.

Agricultural education, G. C. CREELMAN (*Ann. Rpt. N. J. Bd. Agr., 38 (1910), pp. 116-120*). The reason why professional men and tradesmen do not return to a rural community to live out the balance of their days is briefly discussed. The Ontario plan for improving agricultural instruction in rural schools, whereby a large number of the rural school-teachers in attendance at the normal schools attend the Ontario Agricultural College for 10 or 12 weeks each year, is outlined and commended.

Debatable issues in vocational education, D. SNEDDEN (*Vocational Ed., 2 (1912), No. 1, pp. 1-12*).—The sphere and necessities of vocational education are defined and a few of its problems discussed. It is stated that "the final test of vocational education is the degree to which it is able to connect itself with right standards of efficiency in the economic world."

Education for the open country, O. J. KERN (*Ann. Rpt. Missouri Bd. Agr., 44 (1911), pp. 161-171, figs. 5*).—An illustrated address dealing largely with the improvement of the physical conditions of the country school.

School gardens as an educational factor. J. HODD (Ann. Rpt. Columbus Hort. Soc., 1910, pp. 27-33).—A brief review of the school garden movement in Europe and America, with particular reference to this work in Cleveland, Ohio.

[School and home gardening] (R. I. State Col. and Bd. Agr. Ext. Bul., 1 (1911), Nos. 1, pp. 9, figs. 2; 2, pp. 13, fig. 1; 3, pp. 32, figs. 13; 4, pp. 100, pls. 19, figs. 4; Ann. Rpt. Bd. Agr. R. I., Dept. School and Home Gardens, 26 (1910).—These bulletins contain information concerning children's exhibits, corn growing contests, and school and home garden work done in Providence and other parts of the State from 1905 to 1910, inclusive, in cooperation with the extension department of the Rhode Island State College, the league of improvement societies in Rhode Island, and other organizations.

Biological training for agricultural students. G. H. CARPENTER (Jour. Econ. Biol., 7 (1912), No. 2, pp. 37-40).—In this paper, which was read before the Association of Economic Biologists, in Dublin, March 28, 1912, the author gives a brief account of the courses in biology given in the Royal College of Science for associateship in the faculty of agriculture. The course for the associateship diploma has recently been extended to 4 years. Practical farm work is not taught in this college but a knowledge of farm practice is a rigid entrance requirement.

Economic biology for high school. A. E. SHIRLING (School Sci. and Math., 12 (1912), No. 6, pp. 473-475).—This outlines a course in economic biology that has been tried out somewhat experimentally in a city high school. Although the tendency had been to neglect pure science work, the familiar, practical treatment given to subjects like forestry, soils, insects, weeds, etc., as they might relate to city conditions, "seemed to make the study seem worth while to the pupils."

The New York high-school course in farm mechanics and drawing. F. W. HOWE (Cornell Countryman, 9 (1912), No. 9, pp. 285-287).—The author claims that the high-school course in farm mechanics aims not so much at personal skill of hand as at the understanding and application of mechanical principles in farm work, and that its products are designed to be put to the test of practical use.

General review of the present status of instruction in agricultural economics. AERLBOE (Arb. Dent. Landw. Gesell., 1910, No. 167, pp. 1-12).—Attention is called to the reasons why instruction in rural economics, taxation, and bookkeeping has not kept pace with the technical subjects of plant and animal production; to the efforts made in the past 10 years in promoting instruction therein by various German organizations; and to the available literature for instruction in these subjects. In the author's opinion there should be a sharp distinction between the problem of the promotion of agriculture in general and the problem as to how the individual farmer, independent of others, can increase the profits of his farm. A discussion of these problems follows.

Recent progress in agricultural economics (Arb. Dent. Landw. Gesell., 1910, No. 167, pp. XI+460+4).—This number comprises 19 lectures delivered at the seventh course of instruction for itinerant instructors offered by the German Agricultural Society at Eisenach from March 31 to April 6, 1910, on various phases of the subject.

Teaching language through agriculture and domestic science. M. A. LEIPER (C. S. Bur. Ed. Bul., 1912, No. 18, pp. 30).—This bulletin is intended as a practical aid to teachers in the elementary and grammar grades, and especially those in rural schools. There are, in addition to practical suggestions as to the choice of subject-matter for oral and written composition work in the rural school, books relating to agriculture, home economics, and nature study

classified with respect to their adaptability for the various grades. Outlines are also presented, grade by grade, that the rural teacher may have, in the correlation of practical rural-life subjects with language work, a source from which he may draw or to which he may add such topics as may appeal to his pupils and suit local conditions.

Vocational schools and itinerant instruction in the promotion of cattle breeding and utilization. V. SCHUMY (*Land u. Forstw. Unterrichts. Ztg.*, 25 (1911), No. 3 1/2, pp. 221-228).—In this article the author suggests how the agricultural school and itinerant instruction may be utilized by adding farm management and agricultural commerce to the curriculum of the agricultural school. This would give more attention to theoretical instruction in breeding, feed production, and feeding, and special importance to practicals in these subjects, short courses, and the assistance of the itinerant instructor in giving advice to individuals and existing organizations for the promotion of cattle breeding and utilization.

Wisconsin bankers' agricultural contests. R. A. MOORE and K. L. HATCH (*Wisconsin Sta. Circ. Inform.* 38, pp. 9, figs. 8).—The object of these contests as stated is to secure a wider dissemination of pure-bred, high-yielding grains adapted to Wisconsin conditions and to encourage improvement in general agricultural practice.

"The first step in this direction is the arrangement for a grain show, to which farmers are invited to bring the best corn and other grains they are now producing and offer them in competition for prizes. At this first meeting, pure-bred seed furnished by the college is distributed by the bankers to all farmers making exhibits. The seed thus distributed is grown by the farmers, and exhibits of the product shown at the bankers' contest the following fall. At the second show there are classes for both the common and the pure-bred varieties of grain. This gives opportunity for definite comparison between the common and pure-bred varieties both in the exhibit and in the field."

The circular presents information as to how to secure and conduct a grain contest, and cites some results of former contests. It is stated that in 1911 over 3,000 samples of pure-bred seed were distributed among farmers and 3,127 exhibits made, with a total attendance estimated at 6,475. Reports from 50 farmers near Mosinee showed a large average increase in the yield of corn produced and the number of hogs owned.

Railroads and farming. F. ANDREWS (*U. S. Dept. Agr., Bur. Statis. Bul.* 100, pp. 47, figs. 2).—This bulletin represents a report on the increasing efforts made by railroad companies of the United States to augment the number of farmers along their lines and to improve agricultural methods.

The total mileage operated by railroads making organized efforts to promote agriculture is estimated at 191,448 miles, or 76.6 per cent of the total mileage, and representing a total farm area in the counties traversed of 810,722,451 acres.

Data are given as to the efforts and methods used by railroads to induce homeseekers to settle along their lines, also to promote agricultural education in cooperation with federal and state experts, instruction trains, railroad farms, demonstration plats, prizes for farm products, agricultural associations, and through improving marketing facilities, supplying farm laborers, increasing the area of farm land, disseminating literature, and encouraging forestry and ornamental gardening.

NOTES.

California University and Station.—H. E. Van Norman, dairy husbandman of the Pennsylvania College and Station, has been appointed dean of the University Farm School at Davis and vice director of the station.

Georgia College.—George A. Crabb has been appointed adjunct professor of agronomy, vice J. E. Turlington, whose resignation has been previously noted, and enters upon his duties March 15.

Illinois University and Station.—Ralph Rodney Root, of Harvard University, has been appointed instructor in landscape gardening.

Purdue University and Station.—J. E. Dougherty has resigned as assistant in poultry husbandry in the university to accept the position of assistant professor of dairy industry and assistant in dairy industry in the California University and Station, with headquarters at Davis, and has been succeeded by Harry Embleton. C. M. Vestal has been appointed assistant in animal husbandry in the Kansas College and Station. Ivan McKellips has been appointed assistant in dairying.

Louisiana Stations.—S. G. Chiquelin and S. E. McClendon, assistant directors respectively of the Sugar Station at Audubon Park and the North Louisiana Station at Calhoun, have resigned, and have been succeeded by W. G. Taggart and J. B. Garrett. I. Seleter has been appointed assistant chemist in the fertilizer and feed stuffs laboratory.

Massachusetts College and Station.—The annual report of the president recommends the appointment of a state commission on agricultural education and organization, to study and report upon the question of the relationship of the State to rural development in Massachusetts. Among other duties suggested for the commission are to collect all state laws bearing on agriculture and country life and the formulation of a new code; advice as to the best methods of aiding agriculture and the form of organization for boards and institutions to carry out the desired policy; and the securing of cooperation among all agencies designed to benefit agriculture and country life.

As a working program, he suggests the following: (1) Secure the best use of present cultivated areas, (2) develop the waste and unimproved areas, (3) help the farmers to secure an adequate farm labor supply, (4) establish a better system of rural credit, (5) devise a more efficient system of marketing, (6) perfect the system of agricultural education, (7) get and keep the right kind of people on the land, and (8) secure a fairly complete organization of agriculture and country life.

The attendance of the college is reported as 555, of whom 184 are in the entering class. Statistics collected in this class indicated that approximately one-third came from farms, while two-fifths have had no farm experience. Of the 147 members who reported a decision as to their life work, 94 per cent intended to follow an agricultural vocation.

The estimates of the college for the ensuing year include increases of \$15,000 for experimental work, \$20,000 for instruction, \$55,000 for general improvements and repairs, and \$210,000 for a three-story and basement agricultural building.

Michigan College.—The department of agricultural education is planning to assist the county commissioners of schools in working out a scheme for the promotion of interest in, and knowledge of, rural and home life among the young people of Michigan. A suggestive constitution which outlines the general plan of organization and work is given in *Moderator-Topics* for October 31.

Nebraska University and Station.—Vernon V. Westgate has resigned as assistant professor of horticulture and assistant horticulturist to become assistant professor of floriculture and gardening in the Washington College. T. V. Moseley and O. H. Lebers have been appointed instructors in agricultural botany and dairying respectively.

Cornell University.—Miss Clara Nixon, assistant in poultry husbandry, has resigned for further study at the Oregon College.

Pennsylvania College and Station.—C. R. Orton, assistant botanist of the Purdue Station, has been appointed assistant professor of botany, vice H. R. Fulton, whose resignation has been previously noted.

Porto Rico University.—The first of the series of agricultural institutes which are to be held in most of the school districts of Porto Rico was recently given at Mayaguez. It extended through one week and was attended by 128 teachers. The instruction was given by instructors of the college of agriculture, and included seed selection, plant propagation, and maintenance of soil fertility. It is planned to have small gardens in connection with rural schools, as well as graded schools, where land is available.

Rhode Island Station.—Dr. B. L. Hartwell has been appointed director.

Vermont University.—In accordance with a joint resolution of the legislature, an educational commission has been recently appointed to inquire into the relationship of the Vermont institutions of higher learning to the State. The personnel of the commission is as follows: Assistant Justice John H. Watson, of the State Supreme Court, chairman; President Nicholas Murray Butler, of Columbia University; President T. N. Vail, of the American Bell Telephone and Telegraph Company and the Western Union Telegraph Company; State Auditor of Accounts H. F. Graham, of Craftsbury; Mayor James F. Estey, of Montpelier; Ex-President F. W. Clement, of the Rutland R. R.; Hon. F. H. Brooks, of St. Johnsbury; Hon. E. H. Porter, late of the Vermont Public Service Commission; and Hon. A. E. Tuttle, of Bellows Falls, president of the State Teachers' Association.

Macdonald College.—The following appointments have recently been made: Wilfrid Sadler, of the Midland Institute, England, assistant in bacteriology. W. M. Aikenhead assistant in horticulture, and Alex R. Ness assistant in animal husbandry. Prof. W. S. Blair has resigned the chair of horticulture and accepted the positions of superintendent of the Kentville, Nova Scotia, Experimental Fruit Farm and Dominion maritime horticulturist. The following graduates have been appointed district demonstrators—local representatives of the college, whose function is to promote interest in scientific agriculture and to advise farmers on scientific questions—G. W. Wood, L. C. Raymond, A. A. Campbell, L. V. Parent, and R. Newton.

Canadian Experimental Farms.—Dr. O. M. Matte has been appointed dominion agrostologist, E. S. Archibald dominion animal husbandman, and O. C. White assistant dominion field husbandman.

American Association of Farmers' Institute Workers.—The seventeenth annual meeting of this association was held November 11 to 13, at Atlanta, Ga., with representatives from 36 States, 2 Provinces of Canada, Porto Rico, and the District of Columbia.

The address of the president, Franklin Dye, was a discussion of the general agricultural situation in the United States, and specifically of some of the

problems with which the farmers' institutes must deal. Among these were wastes through improper farming, lack of method in marketing, and waste of food in the kitchen and of plant food on the farms and through the maintenance of unprofitable animals.

The committee upon institute organization and methods recommended a change of the organization unit, holding that the county is too large an area in most of the States, and that with the township or community unit, all farmers could attend and monthly meetings could be held in many localities. The committee on cooperation with other educational agencies recommended the appointment of a national commission of agricultural education, whose duty it should be to map out the fundamental functions of the different types of educational institutions, and to recommend ways in which a balanced system of agricultural education can be developed with the greatest efficiency and a minimum of duplication. This matter was referred to the executive committee for action. Reports were also received from the committees on institute lecturers, movable schools of agriculture, and women's institutes.

The first topic in the general program was the special province of the farmers' institute. The conclusions reached were that there should be in the modern institute meeting a well defined purpose to make it prepare for more specialized and advanced kinds of extension. The field of the institute is distinctive but not exclusive, and lies chiefly in new territory where there are no facilities for such undertakings as farmers' short courses and the like. The institute also has a place in organized territory where the short course has come, the agricultural train has passed, and the movable school of agriculture has been held.

As regards the relative value to the farmers of the one-day and two or three-day institutes, it was concluded that one-day institutes, although requiring the maximum expense in time and travel, are useful and economical in communities where the families are widely scattered or where the institute habit has not been established. Two-day institutes are a logical sequence to the one-day institute, and more economical of time in the field. The three-day institute enables the workers to do a higher grade of instruction work so far as the individual is concerned but reaches fewer persons. As yet, all three types are deemed necessary, according to the special needs of each community.

The relation of the institute to the agricultural college and experiment station was discussed by G. A. Putnam, who called attention to the fact that the institute system must be prepared to cooperate with the various other forces at work for the betterment of agricultural conditions, and that the relationship between the college faculty and experiment station staff and the farmers' institute workers should be of the closest and most cordial character.

The use of the round-table method was declared to be very helpful in creating interest and in imparting information, and should be more generally adopted. Plans for organizing institutes for women and young people were suggested and the system in use in Oklahoma was quoted as having been entirely successful.

Dr. Tait Butler discussed the desirability of an agricultural journal giving information regularly respecting farmers' institute and other forms of extension work, holding that such a journal would be desirable but impracticable from a financial point of view because of the limited constituency, unless supported by state or national appropriation. In the subsequent discussion of the topic, attention was called to a journal, published by the Department of Agriculture of the Province of Quebec, that had been successful and self-supporting, and to a similar publication in Australia. In both of these instances farmers' organizations receiving state aid were required to subscribe for a sufficient number of copies to supply their members.

The character of the state director's annual report was considered by F. S. Cooley, and held to be governed by whether it is prepared for the farmers' institute board, the legislature, or the general public. The speaker held that the most valuable form of publication for the general public is that which treats rather completely of a single subject, such as corn growing or the care of poultry. In the discussion of this topic attention was called to the use that could be made of separates from the report.

Under the general heading of agricultural cooperation, H. C. Price described the *Landschaften*, *Raiffeisen*, and *Schultz-Delitzsch* systems of obtaining credit. A manual giving exact information for the formation of the *Raiffeisen* banks which had been translated from the French by this Office, was also presented.

Agricultural Cooperation for the Purchase of Supplies was discussed by J. A. Herr, who for some years has been at the head of an organization of this character in Lancaster County, Pennsylvania, and Cooperation for the Preparation and Selling of Agricultural Products, by G. A. Gigault and W. H. Ingling. B. B. Hare, of this Office, presented a summary of data on cooperative fire insurance.

A. L. Cance, in a paper upon Agricultural Cooperation for Providing Farm Labor, stated that no very satisfactory method had yet been discovered for providing farm labor at seasons when most needed. Methods that had been used in various countries were through the formation of cooperative societies to procure laborers from foreign countries or from urban centers and distribute them under contract among the members of the association, through the cooperative employment and use of crews of laborers for special tasks, such as the weeding of vegetables or the gathering of fruit, through the formation of a cooperative or corporate association of the laborers themselves for the purpose of performing certain services, and through collective farming, either by small farmers or by gangs of laborers who obtain land on which to conduct agricultural enterprises in common. Of these propositions the speaker regarded that of the cooperative farm labor bureau and the cooperative employment of labor crews for the year or season as the most hopeful under our conditions and as most immediately practicable.

The federation of agricultural organizations was discussed by C. W. Pugsley, who held that while such a federation could exert a powerful influence, there has as yet been reluctance to sink individuality for a common purpose. He expressed the opinion that any sort of a rural organization or federation, to be of the greatest use, must enroll in its membership a large number of farmers and that its demands and work must be largely directed by the rank and file of the farming classes.

Two round-table discussions were scheduled, the first upon The Use of Illustrative Material in Institute Teaching, conducted by G. I. Christie, and the second upon How Farmers' Institutes Can Assist in the Formation of Cooperative Agricultural Organizations, by A. M. Soule. Both of these round tables revealed the great value of this method of giving instruction in the farmers' institute work.

The officers chosen for the ensuing year were A. O. Sandles, Columbus, Ohio, president; J. H. Miller, Manhattan, Kans., vice president; and John Hamilton, Washington, D. C., secretary-treasurer. The executive committee consists of the president, the secretary-treasurer, R. W. Thatcher, Pullman, Wash., Mrs. F. L. Stevens, Mayaguez, P. R., and Andrew Elliott, Galt, Ontario.

American Association for the Advancement of Agricultural Teaching.—This association held its third annual meeting in Atlanta, November 12, with a program which included three topics for discussion and two reports of special committees.

The opening discussions on The Opportunity and the Responsibility of the Agricultural Colleges for the Preparation of Teachers of Agriculture were made by Dean Russell of Wisconsin and President Butterfield of Massachusetts, the former dealing with the work of the agricultural colleges in training teachers of agriculture through their regular courses and classes, and the latter with special courses and classes organized for this work.

Both speakers recognized the responsibility of the agricultural colleges to undertake the training of teachers of agriculture, particularly for high schools, not only by arranging regular groups of study, but also by providing special facilities through summer schools, movable schools, correspondence courses, etc., for the training of teachers now in service and others who wish to keep in close touch with the work.

D. J. Crosby, of this Office, in opening the discussion on these papers called attention to the rapid development of teacher training courses in the agricultural colleges, and emphasized the importance of giving some attention to the professional side of teachers' courses—to educational psychology, pedagogy, the history of education, agricultural pedagogy, and practice teaching. Dr. True, of this Office, emphasized the fact that in preparing teachers the agricultural colleges have a very complicated problem on their hands, that of preparing teachers for high schools, for the agricultural colleges, and for extension work.

R. W. Stimson, of Massachusetts, thought that not enough instruction in agriculture is being given to prospective teachers, and suggested cutting out higher mathematics, language, and other nonessentials in order that students in teacher training courses might take practically all of the agriculture offered by the college.

The Content of the First Year's Work in High School Agriculture was the topic discussed by W. G. Hummel, of California. Professor Hummel called attention to the need of a general course in the first year of the high school to give the students a proper outlook toward various sciences that they may be called upon to pursue in subsequent years, and outlined a course in agriculture which he had used for several years in California as a means to this end. This course follows very closely that of the secondary course of agronomy published in Circular 77 of this Office, previously noted (E. S. R., 19, p. 793). Running parallel with this course are suggestions for studies and practicums in physiography, botany, chemistry, physics, and geology, so that the pupil who pursues this work not only has a logically developed course of study, but also gets an insight into the beginnings of natural science as they are related to agriculture. This paper was discussed by F. B. Jenks of the Bureau of Education.

At the second session of the convention, President Soule of Georgia read a paper on What Relation Should Exist Between the Experiment Station and Secondary Schools of Agriculture, in which he maintained that secondary schools of agriculture should not attempt research work in agriculture. This position was unanimously approved by the association.

R. W. Stimson presented a progress report upon the use of land in connection with agricultural teaching, in which he gave results of correspondence with a considerable number of teachers of agriculture. He also described the Massachusetts plan of high school instruction in agriculture in which practice for the pupils is secured by having them conduct home projects in gardening, fruit growing, dairying, and animal husbandry. The committee was continued.

F. W. Howe, of Syracuse University, presented a very brief progress report on The Cooperative Use of Equipment and Illustrative Material.

The officers elected for the ensuing year were D. J. Crosby, president; R. W. Stimson, vice president; W. H. French, secretary-treasurer; and W. G. Hummel, E. L. Hatch, and F. B. Jenks, additional members of the executive committee.

A committee on terminology, consisting of D. J. Crosby, A. F. Woods, and K. L. Hatch, was appointed to recommend terms to be employed in designating field practicums, for which such words as "experiments," "field tests," "field trials," "projects," and "problems" are now loosely used.

American Society of Animal Nutrition.—This society held its annual meeting at Chicago, Ill., November 30, 1912. Besides the routine business of the society it was voted to change the name of the organization and enlarge the scope of the work so as to include discussion of problems connected with breeding, judging, and management of live stock in addition to investigations in animal nutrition.

The address of President H. J. Waters, of Kansas, consisted of a report of investigations on the effects of different proteins and ash constituents on the growth of swine. A detailed abstract of this paper will be noted in a later issue.

E. W. Morse, of this Office, presented a paper entitled Suggestions Concerning the Planning and Reporting of Feeding Trials. He recommended the planning of feeding tests in such a way that the results obtained could be treated by modern biometrical and statistical methods, and that the work as a whole should be so systematized and coordinated that the results of each investigator can be compared with those obtained by others. It is realized that at the present time the work is so uncorrelated that a compilation of results on any uniform basis is out of the question.

The standing committee on methods of reporting results of feeding experiments made a special report which likewise contained recommendations urging uniform methods of reporting data of feeding experiments. These recommendations were based to a large extent upon a summary of opinions expressed by a large number of investigators in response to a questionnaire previously submitted by the committee to members of the society. After a brief discussion these recommendations were adopted.

The society voted to meet at the Pan-American Exposition in San Francisco in 1915.

Association of Feed Control Officials of the United States.—The fourth annual convention of this association was held in Washington, D. C., November 18 to 19, 1912. Definitions of cotton-seed meal, gluten feed, oat clippings, white wheat middlings, and gluten meal were among the special subjects for discussion. Other subjects considered were uniformity and the manufacture and control of feeding stuffs generally. The papers presented are listed on page 74 of this issue. Officers were chosen as follows: President, J. D. Turner of Kentucky; vice president, T. J. Bryan of Illinois; secretary, G. M. MacNider of North Carolina; and executive committee, the president and secretary, ex officio, C. D. Woods of Maine, J. K. Haywood of this Department, and L. F. Brown of New York.

Private Cereal Station in California.—According to a note in *Orchard and Farm*, the Sacramento Valley Grain Association has been incorporated to provide land and equipment for a cereal station, to be located about three miles north of Biggs in Butte County, Cal. This station is to be supported by subscriptions and the donors will receive or may sell the surplus seed grain produced. The development of new and more profitable crops for the valley is expected.

A Training School for Agricultural Teachers.—According to *Moderator-Topics*, the Michigan State Board of Education has recently designated the Central State Normal School as the training school for the preparation of teachers of agriculture in the public schools of the State. The state legislature at the coming session will be asked to appropriate sufficient funds with which

to construct an agricultural and general science building with suitable lecture rooms, laboratories, etc., and purchase a demonstration farm.

Princeton University Farm.—According to the *American Agriculturist*, the farm purchased by Princeton University in the spring of 1912 has proved a boon to poor students who work their way through college. Twenty-five acres were put in cultivation, and fifteen students were given work during the summer vacation. Their profits, in vegetables and fruits, after paying all expenses, were \$90 each. A small canning factory was installed to utilize the surplus production, and this allowed the employment of more men.

Boy Scouts of Michigan.—The State of Michigan is endeavoring to turn the boy scout movement to practical utility by organizing the scouts into companies of fire wardens, under the direction of the State Game, Fish, and Forest Warden, W. R. Oates, and the State Fire Marshal, C. A. Palmer. J. H. McGilivray has been appointed supervisor in the field to organize the movement. The forestry department of the Michigan Agricultural College is cooperating in this movement. No boy is expected to risk his life in fighting fires, but rather to assist in notifying the fire warden in his vicinity when a fire is discovered. A system of tests for membership in the organization and of rewards for services performed have been adopted.

The deputy forest warden is also planning to have 5,000 boys plant pine seedlings next year on newly cut-over lands. The seedlings will be secured from the agricultural college plantation, and the railroads will deliver them to the boy scouts free of charge. An honor medal for service is to be given to each scout or company of scouts making a showing in planting the seedlings.

Additional Agricultural Assistance in Wales.—Prof. Bryner Jones, principal of the agricultural department of the University College of Wales, at Aberystwith, has been selected as the first commissioner of agriculture for Wales, with his primary duty to advise the Board of Agriculture and Fisheries as to prospective grants from the Development Fund to Wales, and on the agricultural work of the country generally. There is also to be an agricultural council for Wales, which will meet every six months for the discussion of agricultural questions.

Departmental and Communal Agricultural Instruction in France.—A law of August 21, 1912, reorganizes the departmental and communal agricultural instruction in France. It establishes in each department a bureau of agricultural services, to replace the departmental professors of agriculture previously authorized. This bureau is to have charge of the dissemination of agricultural knowledge, agricultural instruction in public education institutions, economic and social aspects of agriculture, including agricultural insurance and rural hygiene, agricultural information, statistics, direction of experiment fields, technical researches and commissions, and in a general way of all agricultural interests with the exception of the veterinary and forestry services in the agricultural stations.

The departmental professors of agriculture will be known hereafter as the directors of the agricultural services and will be assisted by special professors, having charge of certain local districts. Both the special professors and directors will be subject to the general supervision of the Minister of Agriculture.

New Journals.—*Zentralblatt der Experimentellen Medizin* is a new semi-monthly abstract journal devoted to experimental pathology and pharmacology, which will succeed *Zentralblatt für die gesamte Physiologie und Pathologie des Stoffwechsels*.

Boletín de los Trabajos de la Comisión Central para la Extinción de la Langosta is being issued by the Commission on Locust Control of Colombia. The

Initial number gives the text of the law establishing the commission, the regulations issued in the work, and circulars of information as to means of combating the pest.

The Creamery and Milk Plant Monthly is a new monthly devoted especially to the interests of creamery and milk plant operators. The initial number contains several articles on milk inspection, including one by B. H. Rawl, of the Dairy Division of this Department, on How Proper Inspection Can Aid the Creamery, and also contains abstracts of a number of scientific articles.

Tennessee Agriculture is being published monthly by the Tennessee Department of Agriculture. The initial number contains the rules and regulations governing live stock sanitary control work in the State.

The October number of the *Northwest Journal of Education* announces the addition of a new section of elementary agriculture, to be conducted by Director R. W. Thatcher, of the Washington Station. It is planned to present each month a few "notes" on current happenings in the field of agricultural instruction which will be helpful to teachers of the subject, followed by outlines of experiments and suggestions for illustrative material to be used in class work.

The initial number of the *Rural Educator*, a national monthly magazine for the promotion of rural and agricultural education, has just appeared. The purpose of the magazine is announced as to voice the sentiments of the leaders in rural life and agricultural education, to serve as a medium for the rapid communication of ideas on these subjects, and to give helpful suggestions to rural teachers, preachers, and social leaders.

Miscellaneous.—At the sixty-fourth meeting of the American Association for the Advancement of Science, held at Cleveland, Ohio, December 30 to January 4, the constitutional amendment proposed at the previous meeting establishing Section M, Agriculture, was adopted.

The Brazilian Government has acquired the grounds at Rio de Janeiro used in 1908 for the exposition, and will utilize them for practical experiments in agriculture and horticulture.

Cambridge University has received a grant of \$72,500 for building and equipping an extension to the school of agriculture to accommodate research work in plant breeding and animal nutrition.

A section of foreign students has been established in the French National Institute of Agronomy. The students will be selected through an examination similar to that required of regular students, but after admission they will constitute a separate class. The number to be admitted annually will be restricted to 10.

The agricultural curriculum of the University of Leipzig has been extended by the establishment of a professorship of colonial and tropical agriculture, to which Doctor Arthur Golf has been appointed.

The New York legislature has authorized the commissioner of agriculture to make an examination and investigation of the horse-breeding industry, for the purpose of stimulating and promoting the breeding of horses in New York State.

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